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Photo de couverture: *Phyxioschema gedrosia*, a new spider species from Iran, photo by A. Zamani, see article on page 283.

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Taxonomic notes on *Ponera guangxiensis* Zhou, 2001 (Hymenoptera: Formicidae: Ponerinae), with a new distribution record from Vietnam and the first description of queen, male, and larva

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Abstract: *Ponera guangxiensis* Zhou, 2001 was originally described from Guangxi Province, China, based on workers only. Since then, no further information on this species became available. Recently, we successfully retrieved a complete colony series of *P. guangxiensis* in the northernmost part of Vietnam, close to Guangxi Province. We herein redescribe the worker of *P. guangxiensis* and describe the queen, male, pupa, and larvae for the first time. Furthermore, the utility of using male genitalia morphology for discriminating *Ponera* species is discussed.

Keywords: Ant - taxonomy - dissection - male genitalia - external morphology.

INTRODUCTION

The ant genus *Ponera* Latreille, 1804 was recently assigned by Schmidt & Shattuck (2014) to the *Ponera* genus group of the tribe Ponerini, in the subfamily Ponerinae. A total of 57 accepted species are currently known (AntCat, 2017), and the center of species-richness is found in the Oriental region with 26 species (AntCat, 2017; antmaps.org 2017). Because of the subterranean and cryptobiotic habits (Taylor, 1967), it is hard to find intact nests of *Ponera* and to retrieve a complete colony containing all castes and sexes. Therefore, until now there are only three *Ponera* species (*P. incerta* Wheeler, 1933, *P. pennsylvanica* Buckley, 1866, and *P. woodwardi* Taylor, 1967; see Taylor, 1967 and AntCat, 2017) of which all castes and sexes have been documented completely.

In Vietnam, a core area of the Indo-Burma biodiversity hotspot (Myers *et al.*, 2000; Sterling *et al.*, 2006), Eguchi *et al.* (2014) recognized five morphospecies of *Ponera* for which the species-level status and their identification is currently being reconsidered by the present authors, this partly due to the lack of complete colony series. Recently, the first author recognized two complete colonies and one

incomplete colony of *Ponera guangxiensis* Zhou, 2001 in our most recent collection made near Mount Mau Son (Lang Son Province, Vietnam), which is located near the type locality of *P. guangxiensis*, i.e., Guangxi Province, southern China.

In the present paper, based on the newly obtained colony series and the images of the type specimens provided by Dr Shan-Yi Zhou, we hereby redescribe the worker of *P. guangxiensis* and describe the queen, male, pupa, and larvae for the first time. Furthermore, we discuss the utility male genitalia morphology for discriminating *Ponera* species.

MATERIAL & METHODS

Photography

Specimens were examined under a stereomicroscope (Leica Z16 APO, Wetzlar, Germany) and photographed using digital cameras (Leica DFC490, Wetzlar, Germany). For scanning electron microscopic observation, specimens were sputter-coated with a SPI Module and imaged with a JSEM-5600, JEOL.

Abbreviations of institutions/collections

- IEBR Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet Road, Nghia Do, Cau Giay, Hanoi, Vietnam.
- MHNG Muséum d'histoire naturelle Genève, 1 route de Malagnou, 1208 Genève, Switzerland.
- NMNS National Museum of Natural Science, Taichung, Taiwan.
- OMNH Osaka Museum of Natural History, Osaka, Japan.

Terminology

Morphological terminology follows those in Taylor (1967) and Keller (2011) for the worker and queen, Boudinot (2013, 2015) for the male, and Wheeler & Wheeler (1976) for the larva. The measurements and indices follow those in Taylor (1967). All measurements are given in millimeters.

- HL** Head length. Maximum length of head in full-face view, measured from posterior most points of head to anterior most point of median clypeus in full-face view of head.
- HW** Head width. Maximum width of head in full-face view (excluding the eyes in female, but including the eyes in male).
- SL** Scape length. Maximum length of scape in external view (excluding the basal neck and condyle).
- PrW** Pronotum width. Maximum width of pronotum in dorsal view.
- PeNL** Petiolar node length. Maximum length of petiolar node in lateral view, measured between of the inflections of petiole peduncle.
- PeW** Petiolar node width. Maximum width of petiolar node in dorsal view.
- CI** Cephalic Index, $(HW/HL) \times 100$.
- SI** Scape Index, $(SL/HW) \times 100$.

TAXONOMY

Ponera guangxiensis Zhou, 2001

Figs 1-13

Ponera guangxiensis Zhou, 2001: 37-18, figs 33-34.

Type locality: Huashuichong Natural Protection Area, Guangxi Province, China.

Images of type material examined: 1 paratype worker, 31 VIII 1998, Huashuichong Natural Protection Area (ca. 24.4246°N, 111.2276°E), Guangxi, China, SY Zhou leg.

Non-type material examined: 1 worker, 1 alate queen, 1 male (colony: CML12ix17-Col.22; OMNH: LCM00052_1 alate queen, LCM00053_1 male, LCM00054_1 worker), Vietnam, Lạng Sơn Province,

Mount Mau Son, 21.8370°N, 106.9139°E, ca. 990 m alt., 12 IX 2017, CM Leong leg. – 9 workers, 1 dealate queen, 1 alate queen, 9 pupae, 2 larvae (CML13ix17-Col.21; NMNS: LCM00055_1 worker, LCM00056_1 worker), Vietnam, Lạng Sơn Province, Mount Mau Son, 21.8417°N, 106.9419°E, ca. 904 m alt., 13 IX 2017, CM Leong leg. – 5 workers, 1 dealate queen, 9 alate queens, 1 male, 13 pupae (CML15ix17-Col.07; MHNG: LCM00058_1 worker, LCM00057_1 worker; IEBR: LCM00059_1 alate queen, LCM00060_1 dealate queen; OMNH: LCM00061_1 male, LCM00062_1 pupa, LCM00063_1 larva), Vietnam, Lạng Sơn Province, Mount Mau Son, 21.8525°N, 106.9454°E, ca. 866 m alt., 15 IX 2017, CM Leong leg.

Species diagnosis: *Ponera guangxiensis* Zhou, 2001 can be distinguished from the other congeners by a combination of the following characteristics in the worker: masticatory margin of mandible edentate except for the apical and two preapical teeth; antennal scape, when laid backward, not reaching the posterior corner of head, with the remaining distance of head to posterior corner of head about 5% of the scape length; antennal club five-merous; metanotal groove distinct and thin; petiolar node in dorsal view semicircular, with strongly and roundly convex anterior margin, and almost straight and roundly concave posterior margin, in lateral view with posteromedian portion of the dorsum slightly sloping posteroventrad; petiolar node in lateral view slightly higher at the anterodorsal corner than at the posterodorsal corner; subpetiolar process with distinct posteroventral teeth.

Description of the worker

Measurements and indices: Workers (n = 5): HL 0.55-0.57; HW 0.45-0.52; SL 0.36-0.38; PrW 0.38-0.41; WL 0.75-0.82; PeH 0.39-0.41; PeNL 0.19-0.21; PeW 0.32-0.34; CI 81-92; SI 72-83.

Head: Head in full-face view with posterior margin straight to slightly convex; lateral margin weakly convex (Fig. 1). Eye small; the longest axis having 5-7 minute ommatidia. Anterior clypeal margin with median blunt tooth (Fig. 2A). Masticatory margin of mandible edentate, except for three large teeth in the apical part (one apical and two preapical teeth; Fig. 2B). Antennal scape, when laid backward, not reaching the posterior corner of head, with remaining distance of head to posterior corner about 5% of scape length; ratio of the length of antennal segment VI-X approximately 1.00: 1.25: 1.67: 2.64: 3.07 (n = 5).

Mesosoma: Dorsum of mesosoma slightly convex in lateral view (Fig. 3A). Pronotal disc in dorsal view with broadly convex anterior margin (Fig. 2C). Promesonotal articulation distinct but weakly incised (Figs 2E, 3A). Metanotal groove distinct and forming a narrow suture (Fig. 2C, E). Propodeal dorsum in dorsal view moderately broad; posterodorsal corner of propodeum broadly round in lateral view.

Metasoma: Petiolar node in dorsal view semicircular, ca.

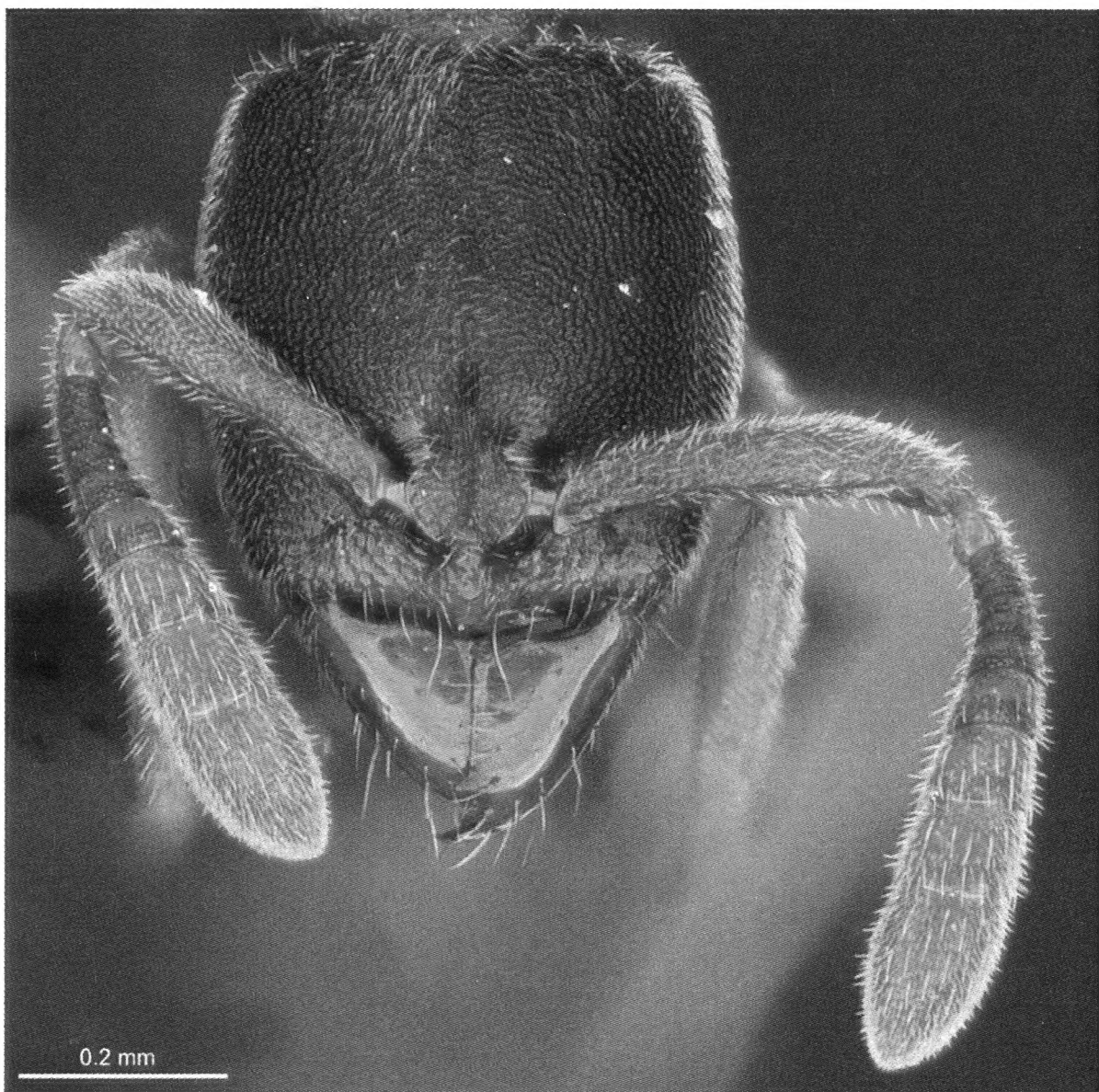


Fig. 1. *Ponera guangxiensis*, worker (colony: CM-L12ix17-Col.22; specimen: LCM00054), head, full-face view.

0.5 times as long as wide, with roundly convex anterior margin and almost straight posterior margin (Figs 2D, 3B), with posteromedian portion of the dorsum slightly sloping posteroventrad. Petiolar node in lateral view with straight anterior margin, slightly convex posterolateral margin and convex dorsal margin, with its anterodorsal corner slightly higher than posterodorsal corner (Figs 2F, 3A). Subpetiolar process in lateral view with medium-sized posteroventral teeth (Fig. 2F), medium-sized fenestra, and very weakly concave ventral margin. Abdominal tergum III in dorsal view distinctly broader than length (the ratio = 77-83%; $n = 5$).

Sculpture: Body sculpture as shown in Figs 1, 2 and 3. Dorsum of head capsule strongly and densely punctate (Fig. 2A); the intervals between punctures (ca. 0.010 mm; $n = 5$) much greater than the diameter of punctures (ca. 0.005-0.007 mm; $n = 5$). Mandible smooth and shining with a few superficial hair pits on the lateral surface. Mesosomal dorsum weakly punctate; the density sparser in mesosomal dorsum than in dorsum of head capsule; intervals between punctures ca. 0.013 mm and diameter of punctures ca. 0.005-0.007 mm in pronotal disc ($n = 5$), and intervals between punctures ca. 0.015 mm and diameter of punctures 0.006-0.008 mm in mesonotum and propodeal dorsum ($n = 5$). Lateral face of pronotum very weakly punctate but shining. Mesopleuron with punctate upper portion and weakly striate lower portion. Metapleuron with smooth upper portion, and punctate lower portion. Most portion of propodeum sparsely punctate. Propodeal declivity smooth and shining. Anterior and lateral faces of petiolar node sparsely and very weakly punctate; dorsal face smooth and shining

with a few superficial hair pits; posterior face shining and smooth. Abdominal tergum III weakly and sparsely punctate (interval ca. 0.018 mm; diameter = 0.011 mm).

Setation: Body densely covered with short pubescence (Figs 1-3). Each antennomere with many decumbent long hairs which increase in number through the apex. Anterior clypeal margin with a series of erect hairs including two very long erect hairs (Fig. 2B). Ventral face of mandible with many long and erect hairs. Petiolar dorsum with several long and erect hairs (Fig. 3A); subpetiolar process with few long erect hairs (Fig. 2F). Gastral sterna and gastral terga V-VII with many long erect hairs (Fig. 3B).

Color: Body brown; antenna, mandible, clypeus, legs and posterior half of gaster yellowish orange (Figs 1, 3).

Description of the gyne

Measurements and indices: Gynes ($n = 3$): HL 0.60-61; HW 0.54-0.57; SL 0.40-0.43; PrW 0.50-0.52; WL 0.93-1.02; PeH 0.46-0.47; PeNL 0.22; PeW 0.37-0.38; CI 91-93; SI 71-78.

Body: In overall morphology similar to the worker (Figs 4-5). Antennal scape, when laid backward, not reaching the posterior corner of head, with the remaining distance about 5% of the scape length; ratio of the length of antennal segments VI-X approximately 1.00: 1.23: 1.51: 2.33: 2.96 ($n = 3$). Pronotal disc in dorsal view with broadly convex anterior margin. Mesoscutum well developed and large (Figs 4B, 5B), with moderately broad and deep scutoscutellar sulcus from which transscutal line runs laterad. Mesoscutellar disc suboval with moderately convex anterior and posterior margins. Oblique mesopleural sulcus in lateral view almost straight and incised (Figs 4A, 5A). Upper metapleuron suboval and narrowed ventrad, weakly separated from lower metapleuron by a sulcus. Propodeal corner in lateral view broadly round. Petiolar node in dorsal view semicircular, ca. 0.5 times as long as wide, with strongly and roundly convex anterior margin, and roundly concave posterior margin (Figs 4B, 5B), with posteromedian portion of the dorsum slightly sloping posteroventrad. Petiolar node in lateral view with straight anterior and posterior margins; blunt apex; anterodorsal corner little higher than posterodorsal corner (Figs 4A, 5B). Subpetiolar process with medium-sized teeth, small fenestra, straight ventral margin. Abdominal tergum III in dorsal view distinctly broader than length (the ratio = 78-82%; $n = 3$).

Wings: Forewing (Fig. 6A) Rsfl short and forming a blunt angle with Mfl; Mfl straight and 3 times as long as Rsfl. Mf2 very short, 0.20 times as long as Rs+M; Rs+M running almost at right angle to 1m-cu; dc1 cell subrectangular, with Cu a little longer than Mfl; 2rs-m and 2r-rs oriented at slightly different angles and diverging; Rsf4 and Rsf2-3 forming an blunt angle; the junction of Mfl and Cu present distad to the junction of M+Cu and cu-a; cell smc2 narrowing toward Mf2, with bluntly angulate distal corner formed by Rsf4 and 2rs-m; smc2 cell 0.5 times as long as cell mc1. Hindwing

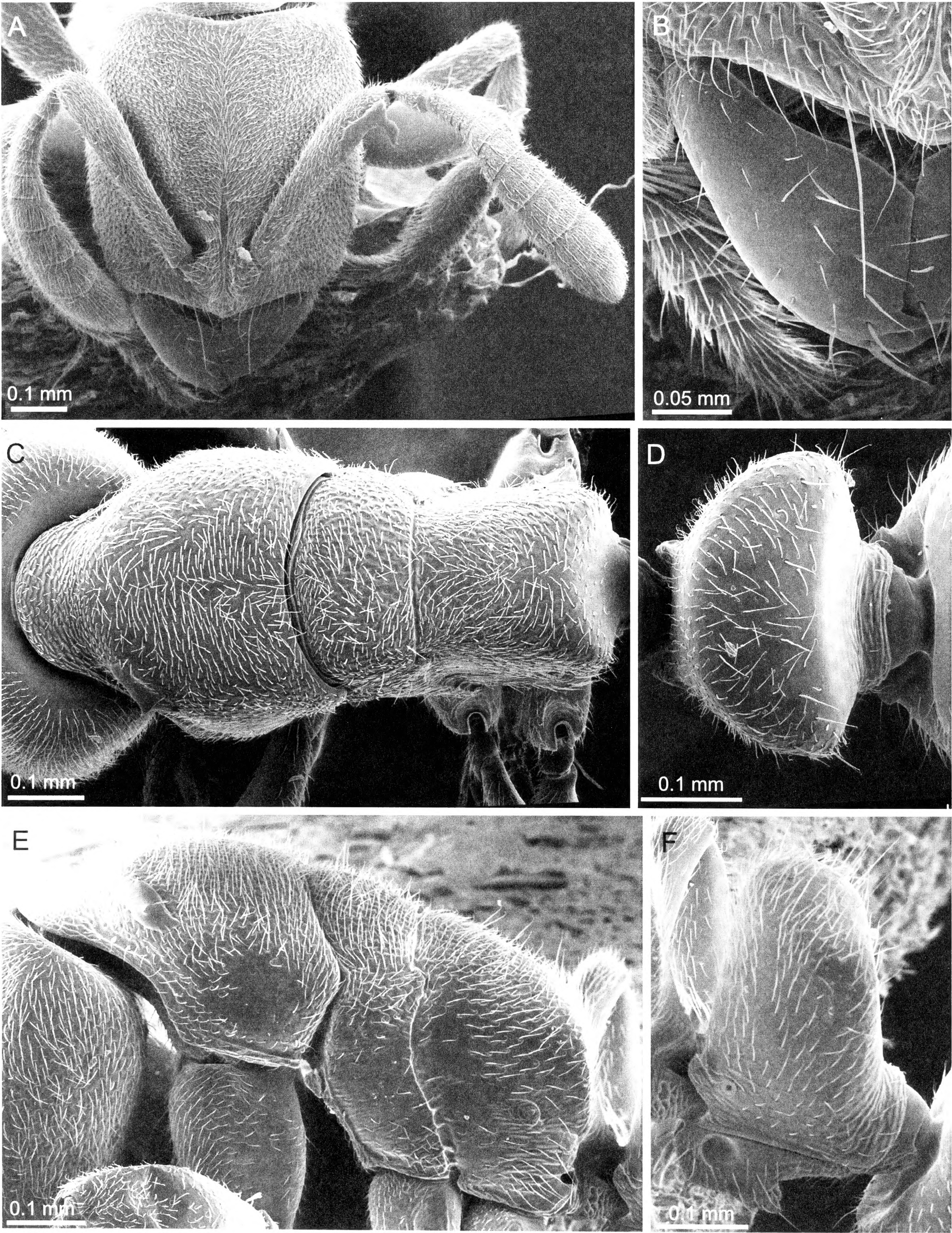


Fig. 2. *Ponera guangxiensis*, worker (colony: CML15ix17-Col.07; specimen: LCM00056). (A) Head, full-face view. (B) Mandible. (C) Mesosoma, dorsal view. (D) Petiole, dorsal view. (E) Mesosoma, lateral view. (F) Petiole, lateral view.

(Fig. 6B): Vein A reaching wing outer margin of wing, but Rsf, Cuf, Mf almost reaching outer margin.

Description of the male

Measurements and indices: Male (n = 1): HL 0.49; HW 0.51; SL 0.06; PrW 0.56; WL 0.98; PeH 0.33; PeNL 0.18; PeW 0.22; CI 106; SI 11.

Head: In full-face view of head (Fig. 7) suboval, broader than long (CI: 106). Gena and lateral portion of clypeus forming a distinctly angulate corner. Median portion of clypeus convex, weakly raised dorsad and forming a diamond-shaped mound; anterior clypeal margin straight. Compound eye large; the longest axis about

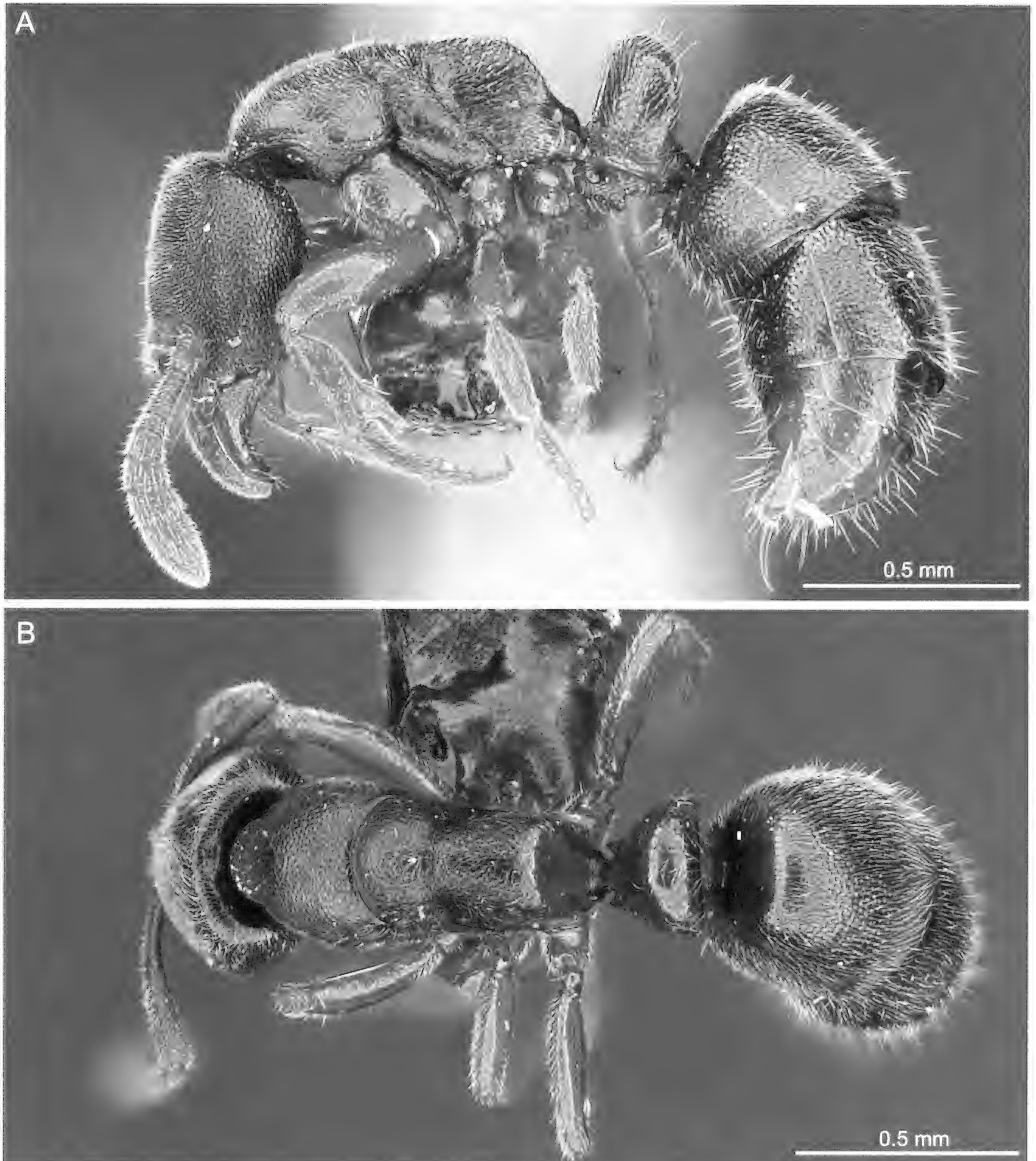


Fig. 3. *Ponera guangxiensis*, worker (colony: CML12ix17-Col.22; specimen: LCM00054). (A) Body, lateral view. (B) Body, dorsal view.

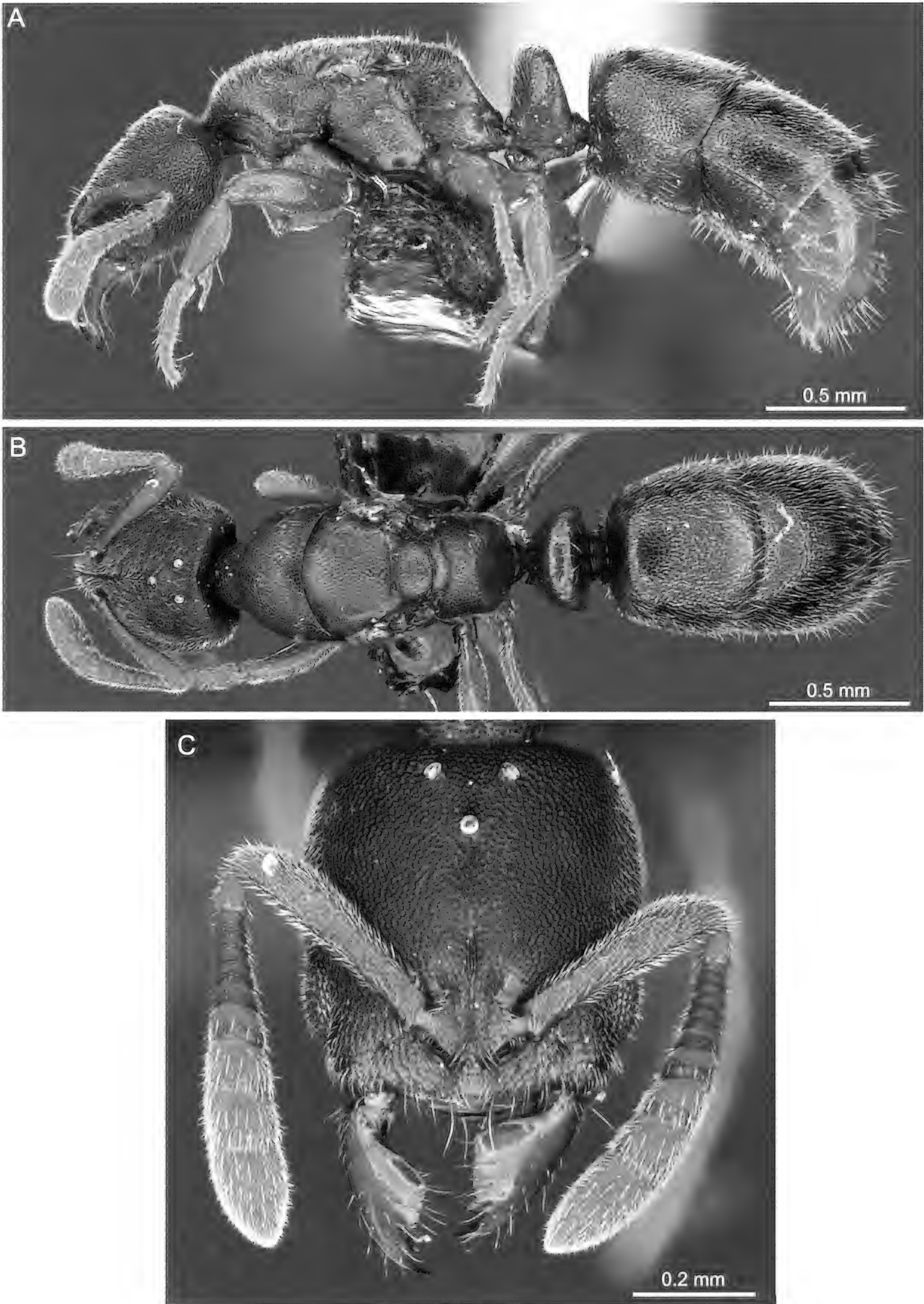


Fig. 4. *Ponera guangxiensis*, dealate queen (colony: CML15ix17-Col.07; specimen: LCM00060). (A) Body, lateral view. (B) Body, dorsal view. (C) Head, full-face view.

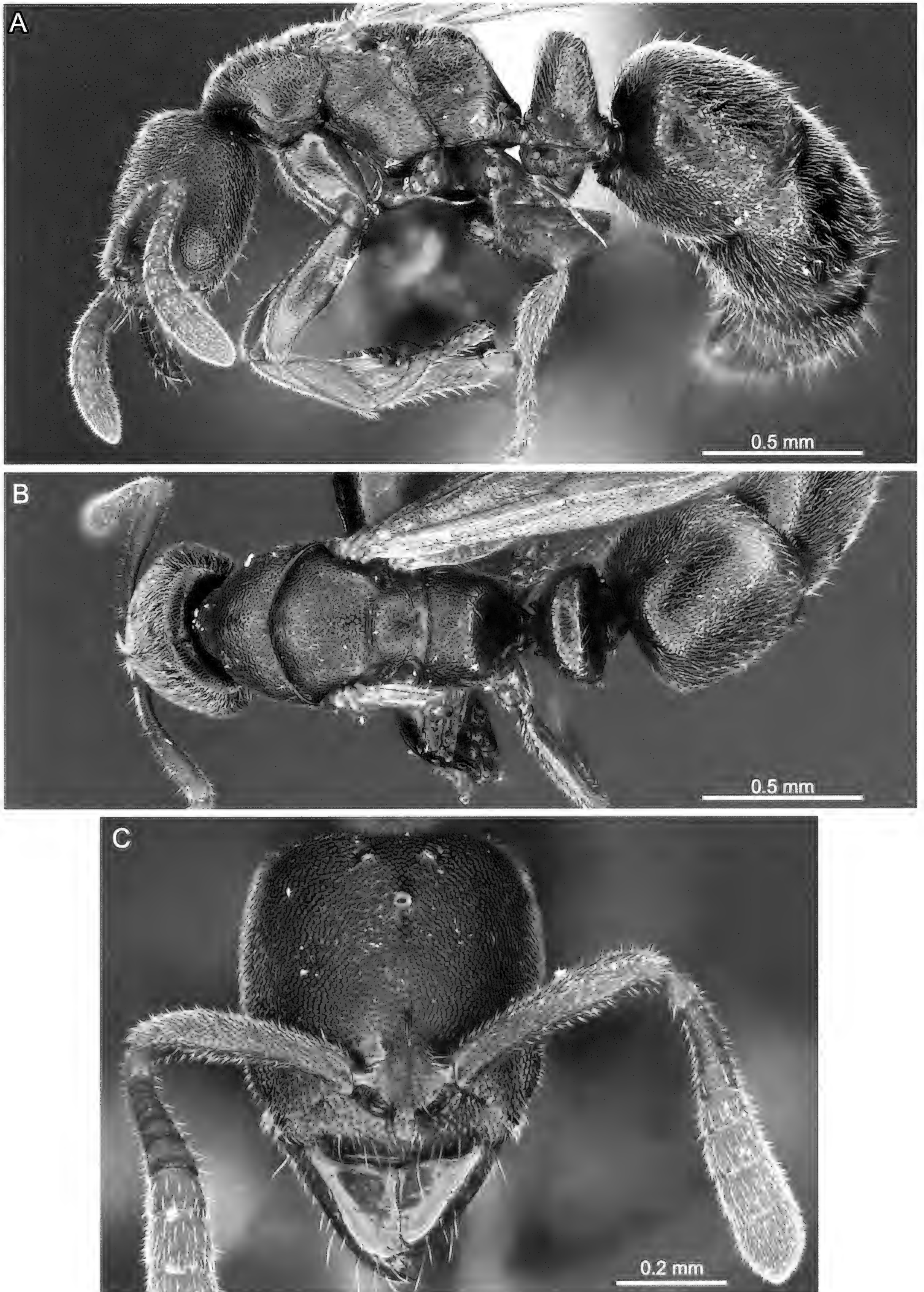


Fig. 5. *Ponera guangxiensis*, alate queen (colony: CML12ix17-Col.22; specimen: LCM00052). (A) Body, lateral view. (B) Body, dorsal view. (C) Head, full-face view.

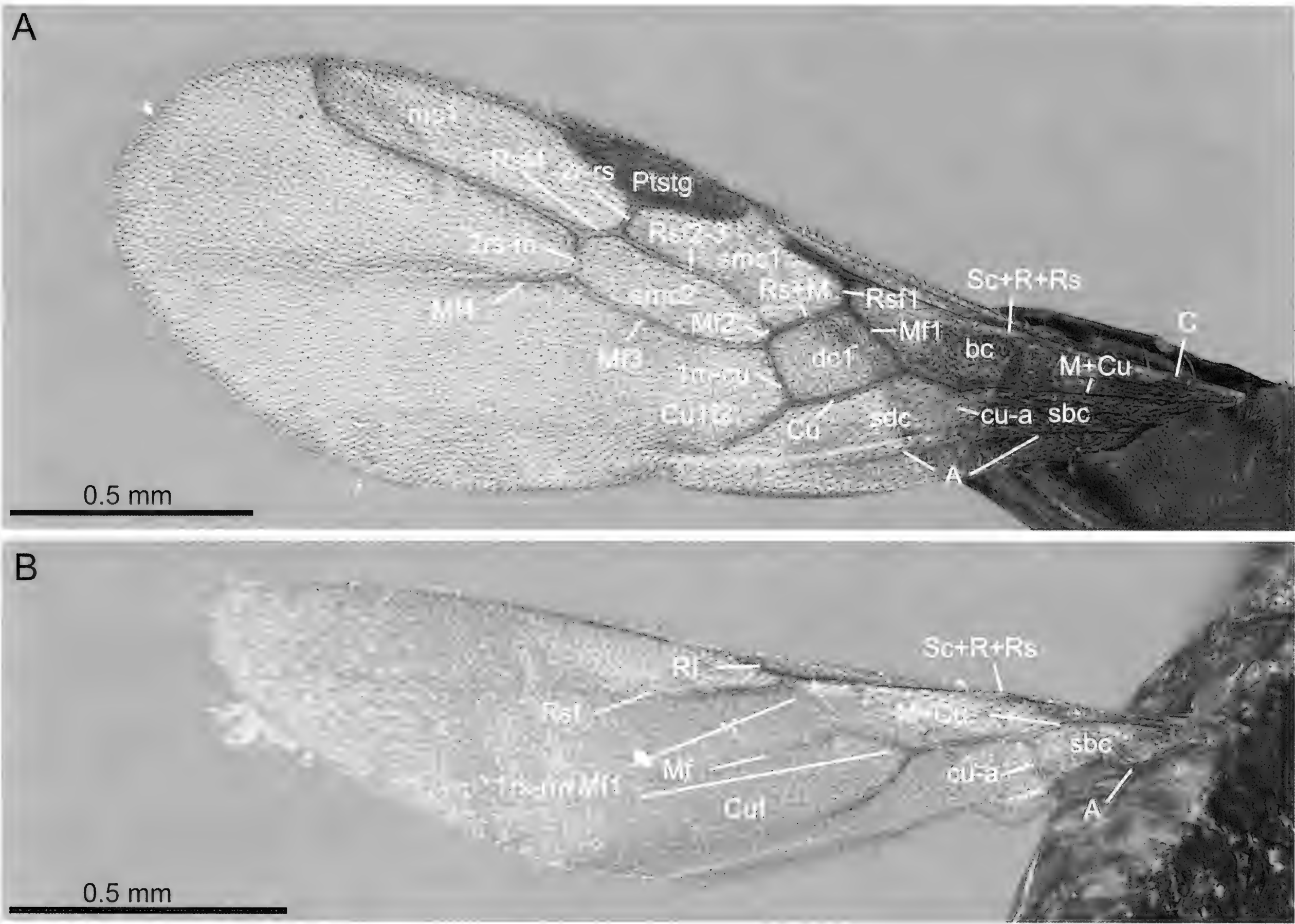


Fig. 6. *Ponera guangxiensis*, alate queen. (A) Front wing. (B) Hind wing.



Fig. 7. *Ponera guangxiensis*, male (colony: CM-L12ix17-Col.22; specimen: LCM00053), head, full-face view.

0.23 mm, with 25 ommatidia. Median ocellus circular, about 0.06 mm in maximum diameter; lateral ocelli subcircular, about 0.06 mm in maximum diameter. Mandible reduced, triangular with sharp apex; mandalus large and subcircular. Palp formula: 4, 2. Antennal scape very short; the ratio of the length of antennal segments I–XIII approximately 1.0: 1.1: 2.7: 2.8: 2.6: 2.7: 2.6: 2.8: 2.7: 3.70: 3.1: 2.8: 3.1: 5.1 (n = 1).

Mesosoma: Mesoscutum well developed and large (Fig. 8B), with broad and deep scutoscutellar sulcus from which transscutal line runs laterad. Mesoscutellar disc sub-trapezoidal with straight anterior margin. Oblique mesopleural sulcus distinct in lateral view. Upper metapleuron suboval, distinctly separated from lower metapleuron by a sulcus. Propodeal corner in lateral view broadly round.

Metasoma: Petiolar node cone-like (Fig. 8A), with steeply sloping anterior margin and ventral posterior margin, in dorsal view oval, broader than long. Subpetiolar process triangular, with indistinct fenestra, with acute anteroventral and round posteroventral corners. Abdominal sternum III prora in lateral view blunt. Posteromedian portion of abdominal tergum VIII acutely

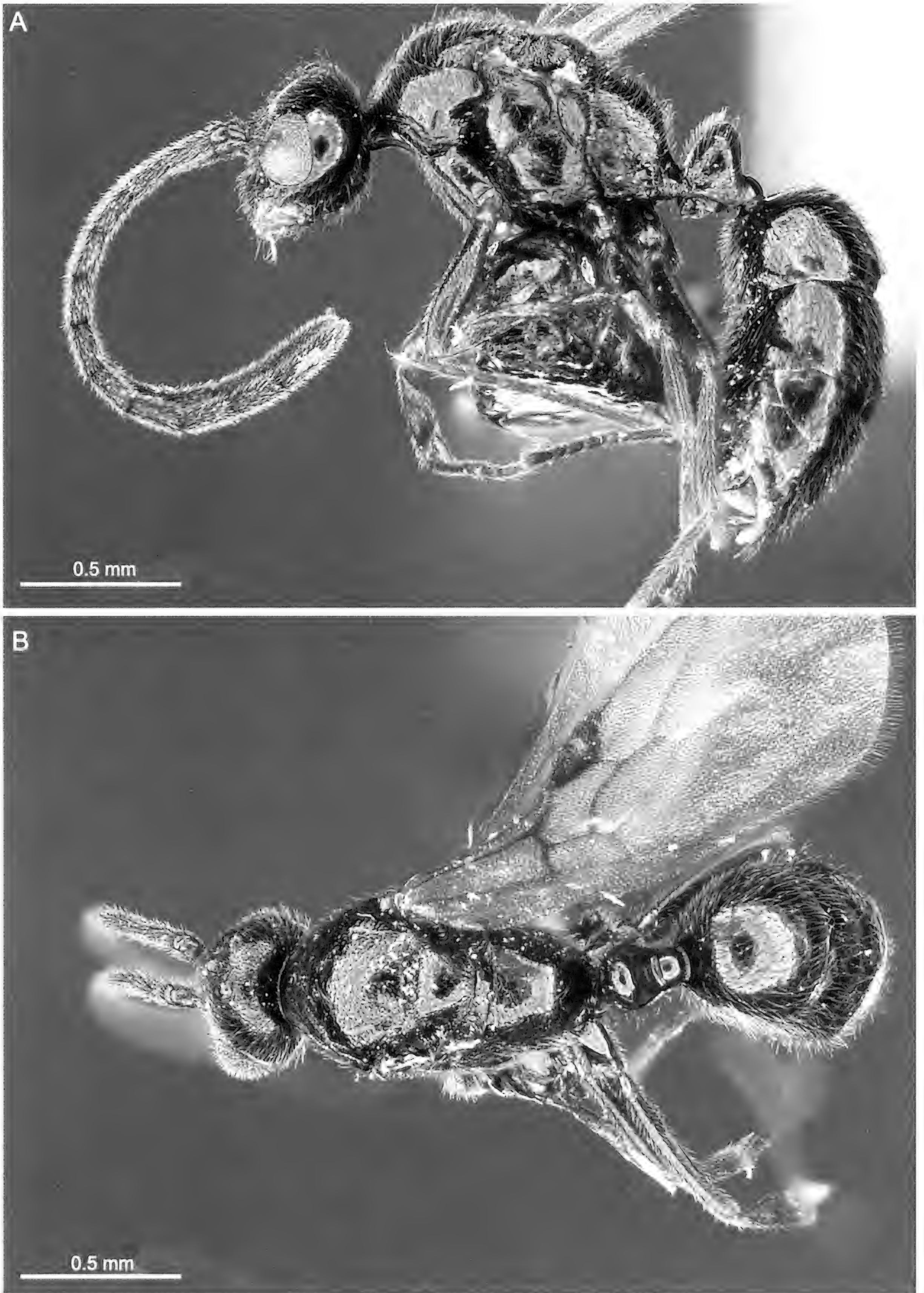


Fig. 8. *Ponera guangxiensis*, male (colony: CML12ix17-Col.22; specimen: LCM00053), body. (A) Lateral view. (B) Dorsal view.

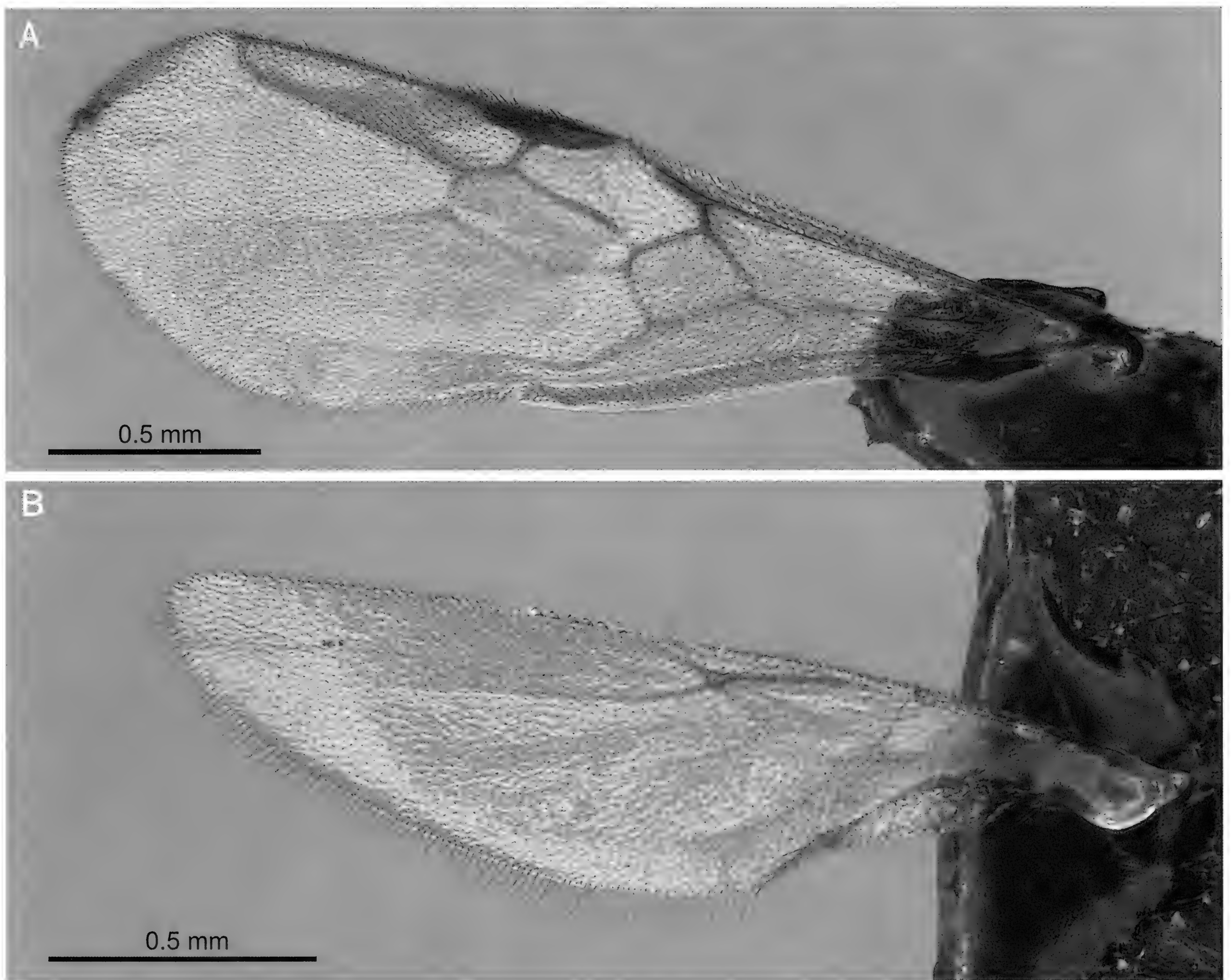


Fig. 9. *Ponera guangxiensis*, male (colony: CML12ix17-Col.22; specimen: LCM00053). (A) Front wing. (B) Hind wing.

sharpened, forming median spine as long as its nearby erect hairs. Fore, middle and hind legs each with a single pectinate tibial spur; middle tibial spur approximately 3 times as large as those of fore and hind legs.

Sculpture: Head weakly and evenly punctate; clypeus evenly punctate. Pronotal dorsum and mesonotum with relatively sparse punctures. Propodeal dorsum smooth. Mesosoma in lateral view with very scattered punctures. Propodeal declivity smooth. Petiolar node with dorsal and posterior faces smooth and shiny, and lateral face with few punctures. Abdominal tergum III evenly punctate.

Setation: Head covered densely with short sub-erect hairs; clypeus with a few long and decumbent hairs. Compound eyes with dense and very short erect hairs (Fig. 6). Mesosoma, petiole and gaster covered densely with short and decumbent/suberect background hairs; petiolar node hairy in anterior face, and propodeal declivity and posterior face of petiole glabrous.

Wings: Similar to those of gyne, as shown in Fig. 9.

Color: Body color blackish brown (Figs 7, 8); antennae and legs dark brown; mandibles blackish yellow.

Genitalia (dissected): Pygostyle digitiform, with 7-8 long erect hairs (Fig. 10A). Apical part of abdominal sternum IX (Fig. 10B) triangular, with angulate apex, ventrally with sparse hairs. Genital capsule almost as long as broad, broadest at the midlength of basimere (Fig. 10C, D), in lateral view subtriangular, distinctly longer than high (Fig. 10E); parameral process in lateral view subtrapezoidal with well protruding posterodorsal corner; telomere in lateral view forming an obtuse dorsomedial process (Fig. 10E), then tapering apicad, with the apex blunt and round (Fig. 10E). Volsella with well developed cuspis and digitus; digitus in mesal view thick at the base, narrowed and bent ventrad in the apical 2/3; cuspis elongate and spatulate (Fig. 10F, G). Valviceps subdivided into distinct apical and ventral lobes by a deep and round apicoventral notch (Fig. 10H); apical lobe broadly and roundly produced apicad; ventral

margin of ventral lobe weakly and roundly convex, with ca. 10 small denticles; valvura weakly curved.

Description of the pupa (worker)

Pupa enclosed by a cocoon. Cocoon yellowish brown, with a dark-brown circular meconium in the anal area. Diameter of cocoon largest around the thorax of pupa, about 0.44 mm (Fig. 11A-B).

Description of the larva (expectedly final instar; but sex and caste unknown)

Body shape pogonomyrmecoid (*sensu* Wheeler & Wheeler, 1976). Head subtrapezoidal (Fig. 12C), with posterior margin straight, with lateral margin well convex. Tentorial pit weakly incised. Labrum thin, with straight anterior margin. Labium well developed, subtrapezoidal, with a pair of labial palps. Each maxilla with 2 palps.

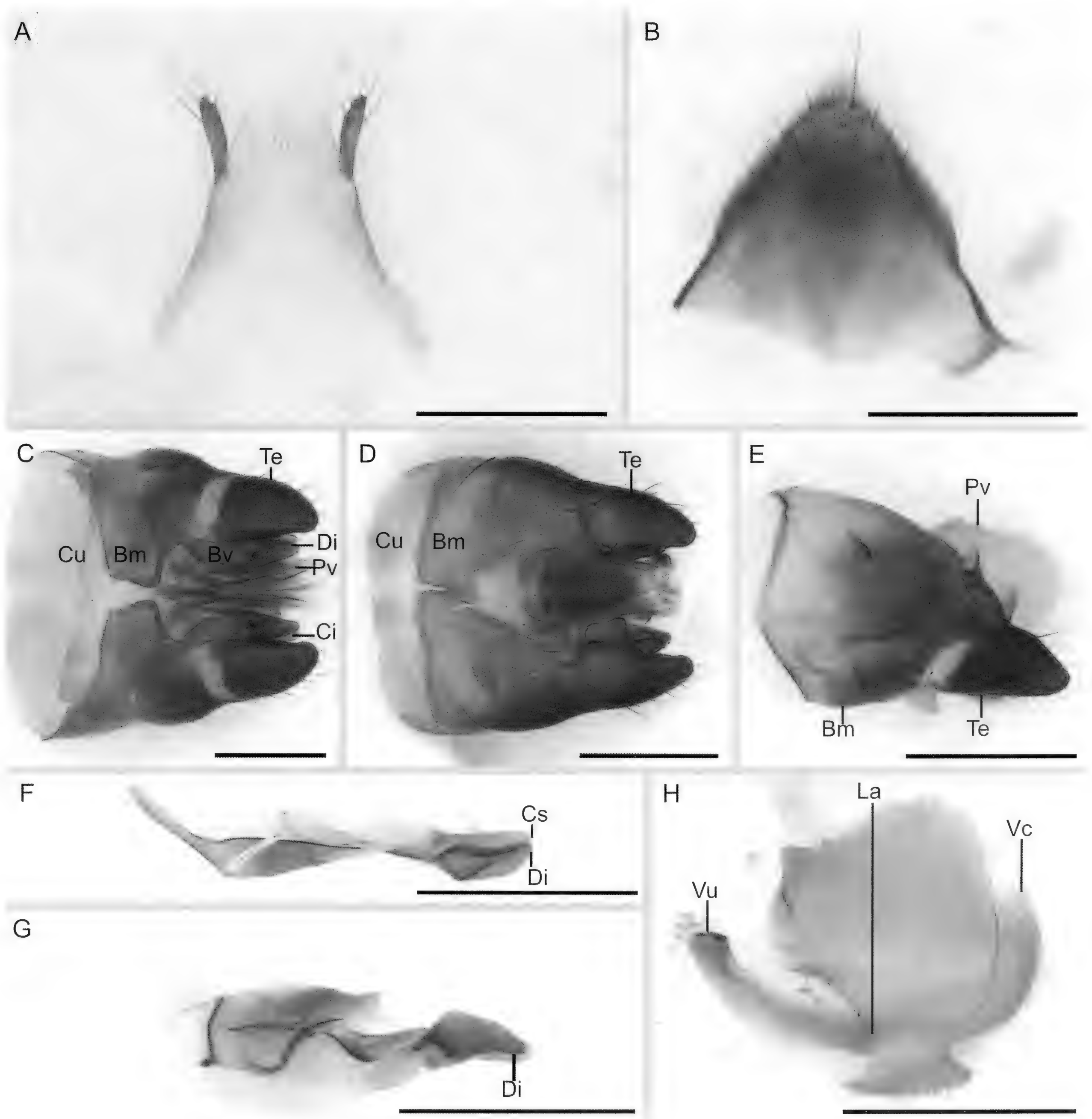


Fig. 10. *Ponera guangxiensis*, male genitalia (colony: CML15ix17-Col.07; specimen: LCM00061). (A) Pygostyle. (B) Abdominal sternum IX. (C) Whole, ventral view. (D) Whole, dorsal view. (E) Left half, lateral view. (F) Left volsella, ventral view. (G) Left volsella, dorsal view. (H) Left penisvalva, lateral view. Abbreviations: Bm basimere, Bv basivolsella, Cs cuspis, Cu cupula, Di digitus, La lateral apodeme, Pv penisvalva, Te telomere, Vc valviceps, Vu valvura. Scale bars = 0.2 mm.

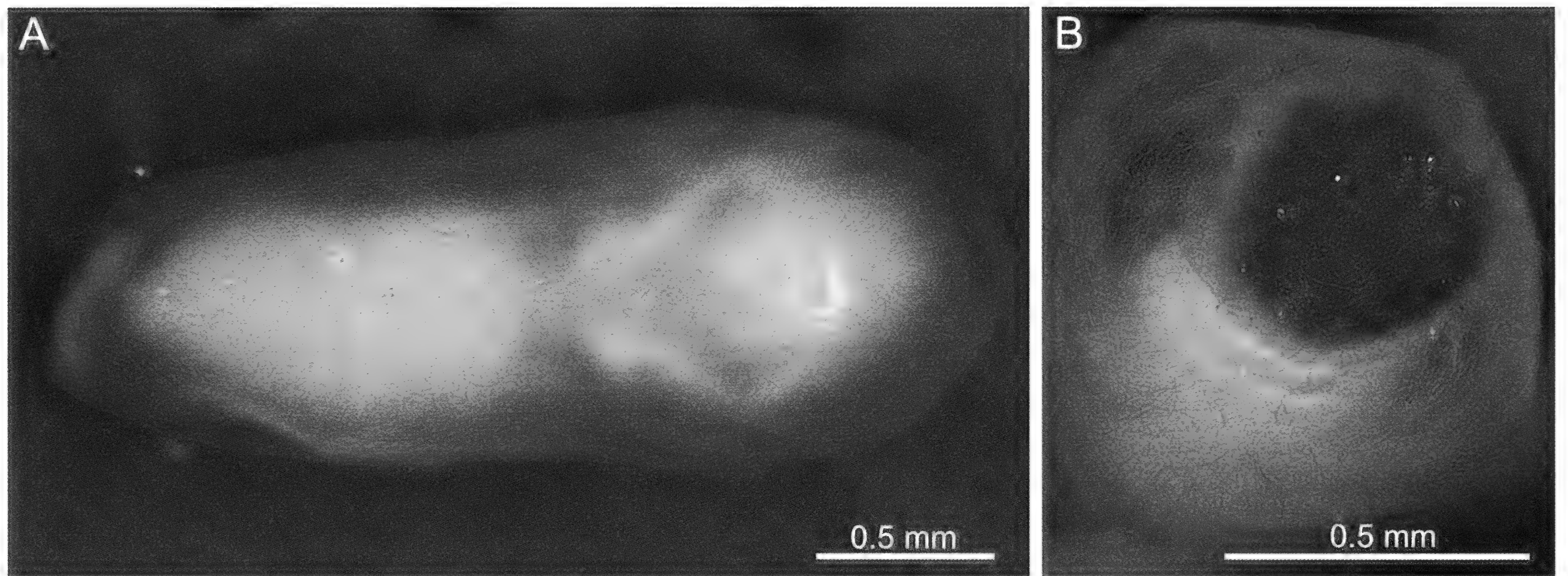


Fig. 11. *Ponera guangxiensis*, pupa of worker (colony: CML15ix-17-Col.07; specimen: LCM00062). (A) Ventral view. (B) Posterior view.

Mandible well sclerotized, pogonomymecoid (*sensu* Wheeler & Wheeler, 1976), with a total of 3 teeth. Antenna with base weakly raised. Thoracic segment I (TI) with ca. 12 slender and simple subcones which are arranged as a single whorled series. Each of TII-TIII and AI-AVII with ca. 20 slender and simple subcones which are arranged as double whorled series dorsally and a single whorled series ventrally. Each of AVI-AVII additionally with a pair of glutinous tubercles. The remainder of abdominal segments (after AVII) with increasing numbers of slender and simple subcones. Head with a few erect hairs (ca. 30 hairs). Body color yellowish white.

Distribution and nesting sites: Guangxi Province, China and Lạng Son Province, Vietnam (new record). The nests of *P. guangxiensis* were found inside the rotten wood, under the moss or under the stone in humid environments (Fig. 14).

DISCUSSION

In the previous studies, the male genitalia in the genus *Ponera* have so far been documented with illustration only from a European species, *P. pennsylvanica* Buckley, 1866 by Taylor (1967), and a Japanese species, *P. scabra* Wheeler, 1928, by Ogata (1987), respectively. In the present study, the examined male genitalia of *P. guangxiensis* are clearly distinguishable from those of *P. pennsylvanica* and *P. scabra* as shown in Fig. 14:

1. the valviceps is subdivided into distinct apical and ventral lobes by a deep and round apicoventral notch, and the apical lobe broadly and roundly produced apicad in *P. guangxiensis*, but not subdivided into distinct apical and ventral lobes in *P. pennsylvanica*, or weakly subdivided by a shallow and broad concavity in *P. scabra* (see Fig. 14A-C);
2. the relative length of the ventral lobe to valviceps

is much smaller in *P. guangxiensis* than in *P. pennsylvanica* and *P. scabra* (arrow in Fig. 14A-C);

3. the telomere in lateral view has broadly and roundly concave distidorsal margin in *P. pennsylvanica* and *P. scabra* (Fig. 14E-F), but slightly convex distidorsal margin in *P. guangxiensis* (see Fig. 14D);
4. the genital capsule in lateral view has a distinct posterodorsal corner in *P. pennsylvanica* (Fig. 14B) or a large projection in *P. scabra* (Fig. 14F), but a small projection in *P. guangxiensis* (see Fig. 14D).

Given the degree of interspecific differences described above, male genitalia appear thus as a promising character for discriminating *Ponera* species, especially for species with workers having a similar external morphology, as in the case of many Ponerinae (see Satria *et al.*, 2015, 2017).

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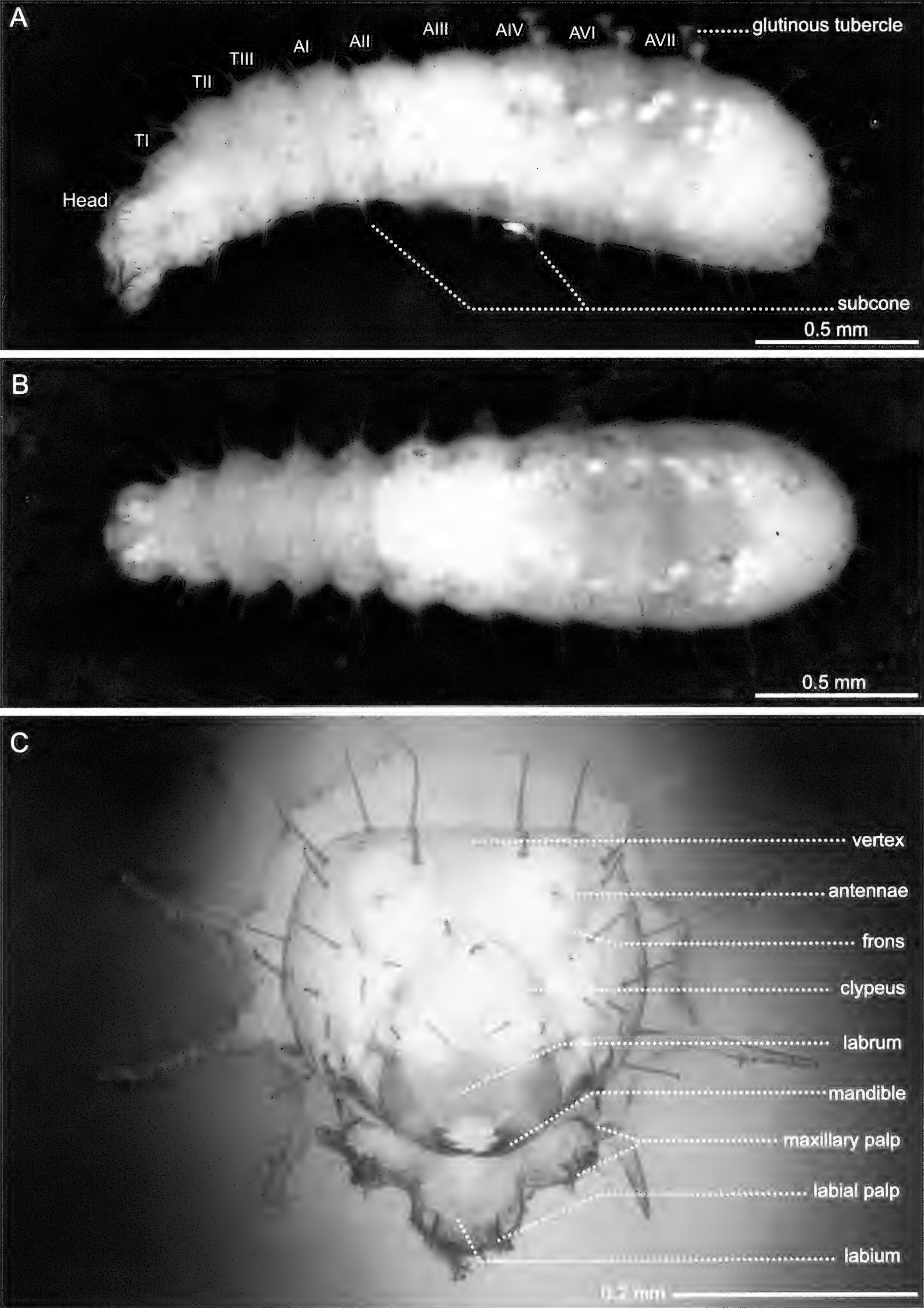


Fig. 12. *Ponera guangxiensis*, larva (colony: CML15ix-17-Col.07; specimen: LCM00063). (A) Body, lateral view. (B) Body, dorsal view. (C) Head, full-face view.



Fig. 13. *Ponera guangxiensis* (colony: CML12ix17-Col.22). Left: rocky cliff covered by moss, uncovered nesting site indicated in a white square. Right: enlarged view of the white square (10:35 UTC+8, 12/09/2017).

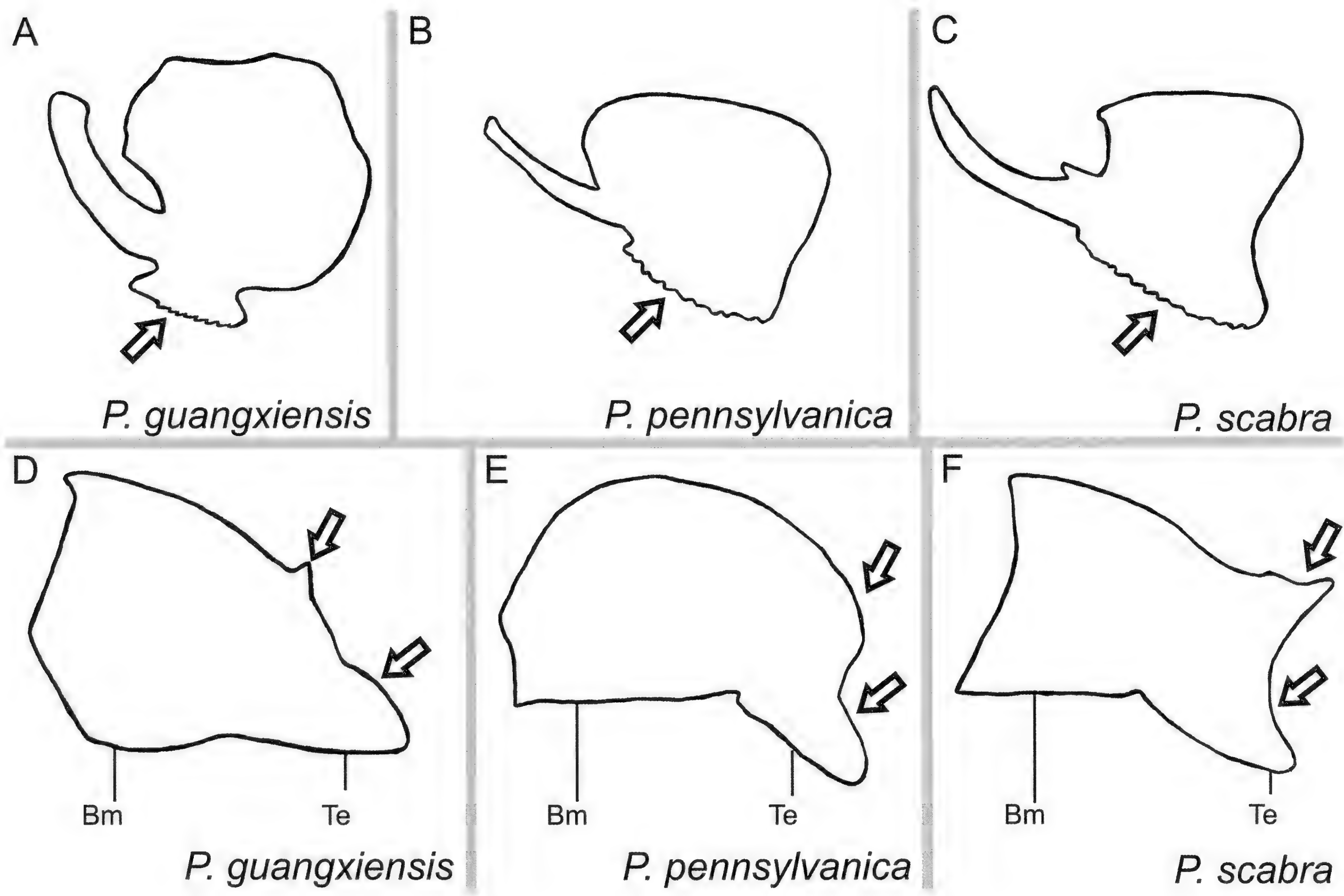


Fig. 14. (A-C) Left penisvalva, lateral view. (A) *Ponera guangxiensis*. (B) *P. pennsylvanica* (redrawn from Taylor, 1967). (C) *P. scabra* (redrawn from Ogata, 1987). (D-F) Left half of genital capsule, lateral view. (D) *Ponera guangxiensis*. (E) *P. pennsylvanica* (redrawn from Taylor, 1967). (F) *P. scabra* (redrawn from Ogata, 1987). Abbreviations: Bm basimere, Te telomere.

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A new species of *Dactylopisthes* Simon, 1884 from Thailand (Araneae, Linyphiidae)

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Abstract: A new spider species, *Dactylopisthes marginalis* sp. nov., is described from Thailand on the basis of a single male. The species seems to be most similar to the East Palaearctic - West Nearctic *D. video* (Chamberlin & Ivie, 1947), but clearly differs by its unmodified carapace and by a few details of the palp.

Keywords: Erigoninae - Oriental Region - Southeast Asia - new species.

INTRODUCTION

The erigonine genus *Dactylopisthes* Simon, 1884 comprises eight species (World Spider Catalog, 2018), seven of which are restricted to different parts of the Palaearctic and one species, *D. video* (Chamberlin & Ivie, 1947), which occurs in the East Palaearctic and in the West Nearctic. The description of a new species of *Dactylopisthes* from Thailand is the subject of the current paper.

MATERIAL AND METHODS

This paper is based on a spider specimen collected in Thailand and kept at the Muséum d’histoire naturelle de Genève, Switzerland (MHNG). The corresponding sample number is given in square brackets. The specimen preserved in 70% ethanol was studied using a MBS-9 stereomicroscope. A Levenhuk C-800 digital camera was used for taking photos. The terminology of copulatory organs mainly follows that of Merrett (1963), Saaristo (1971) and Hormiga (2000). The chaetotaxy is given in a formula, e.g., 2.2.1.1, which refers to the number of dorsal spines on tibiae I-IV. The sequence of leg segment measurements is as follows: femur + patella + tibia + metatarsus + tarsus. All measurements are given in mm. Scale lines in the figures correspond to 0.1 mm unless indicated otherwise.

Abbreviations

- a.s.l. above sea level
- C cymbium
- D duct
- DP distal process of DSA

- DSA distal suprategular apophysis
- E embolus
- LP lateral process of DSA
- MM median membrane
- PP proximal process of DSA
- RA radical apophysis
- Su suprategulum
- Ti tibia
- TmI position of trichobothrium on metatarsus I

TAXONOMY

Dactylopisthes marginalis sp. nov.
Figs 1-7

Holotype: MHNG; male; THAILAND, Kanchanaburi Province, Sai Yok National Park, near park headquarters, 120 m a.s.l.; 14.XI.2000; leg. P. Schwendinger [sample TH-00/08].

Diagnosis: The male palp conformation, namely, the structure of the embolic division in *D. marginalis* sp. nov., is most similar to that of the East Palaearctic - West Nearctic *D. video* (Chamberlin & Ivie, 1947). From it and from other congeners the new species clearly differs by its unmodified carapace, by its short tibial apophysis, as well as by the presence of a thin and long process on the distal suprategular apophysis (PP in Figs 2, 6). All known males of *Dactylopisthes* species (*D. separatus* Zhao & Li, 2014 is so far only known from females) have an elevation on the carapace, and the palpal tibia is equipped with a long, usually sickle-shaped apophysis. In this sense *D. marginalis* sp. nov. seems to be an exceptional representative.

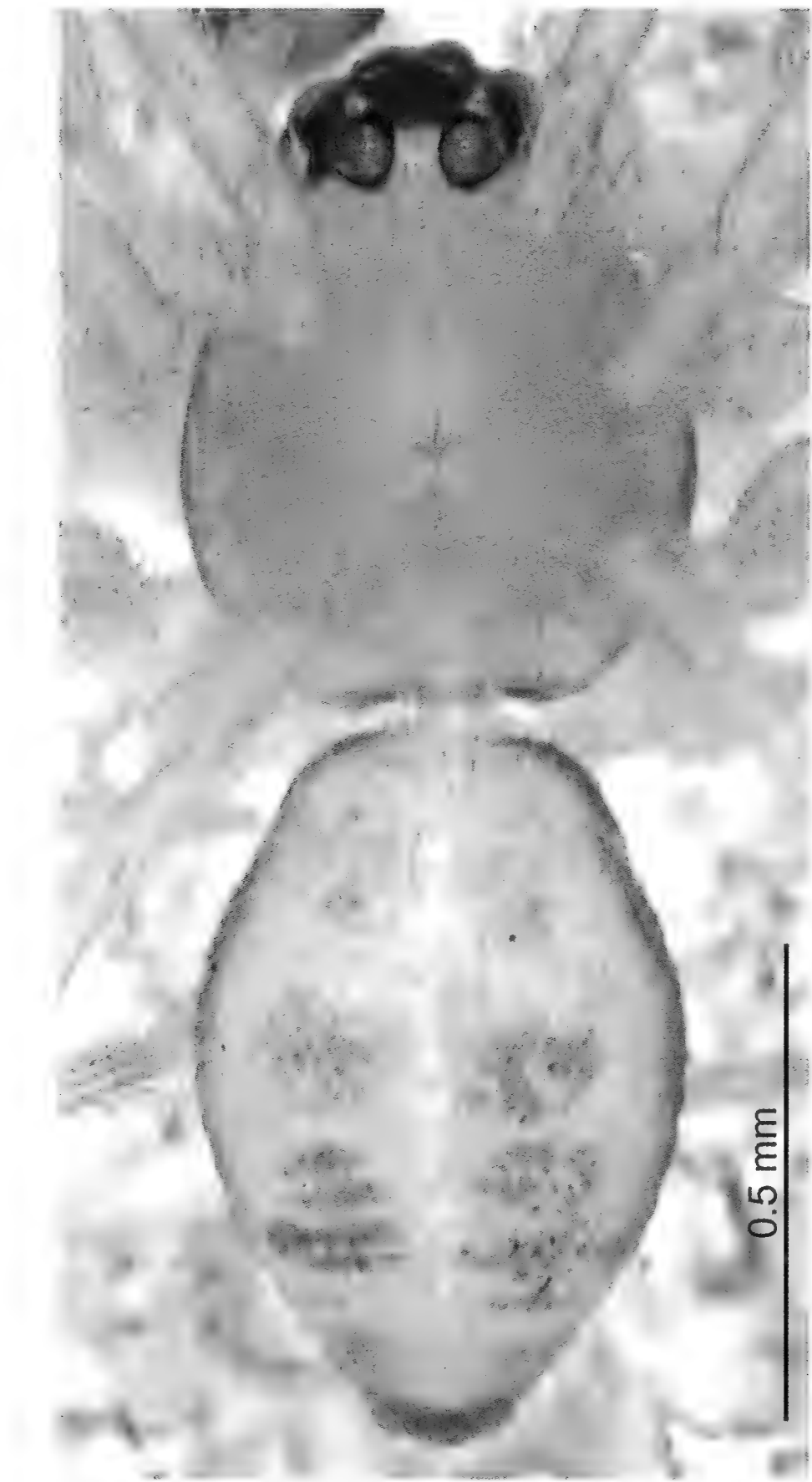
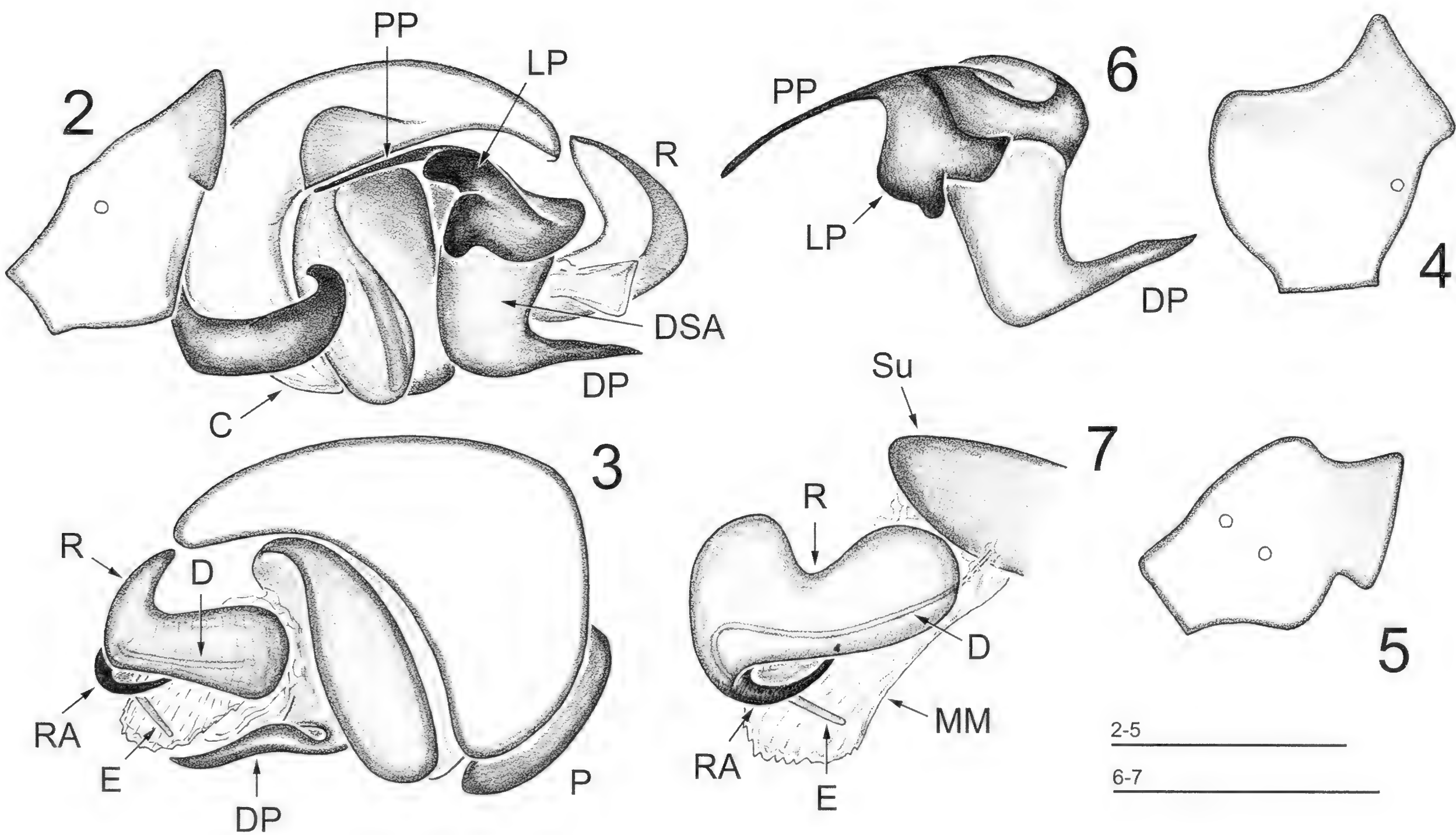


Fig. 1. Photograph of *Dactylopiastes marginalis* sp. nov., male holotype, dorsal view.

Nevertheless, somatic characters, i.e. size, chaetotaxy, trichobothriotaxy, and especially structure of the embolic division, as well as the shape of the distal suprategular apophysis support the generic placement of the new species.

Etymology: The specific epithet is a Latin adjective referring to marginal systematic position of the new species within the genus.

Description: *Male holotype.* Total length 1.40. Carapace unmodified (Fig. 1), 0.65 long, 0.53 wide, rounded, greyish pale yellow. Eyes normal, not enlarged. Chelicerae 0.28 long, mastidion absent. Legs pale yellow. Leg I 2.15 long (0.53+0.18+0.53+0.53+0.38), IV 2.24 long (0.58+0.20+0.55+0.53+0.38). Chaetotaxy 2.2.1.1, metatarsi unarmed. Length of spines 1.5-2 diameters of leg segment. Metatarsi IV without trichobothrium. TmI 0.42. Palp (Figs 2-7): tibia short, with a wide, keel-shaped lateral outgrowth. Paracymbium well-sclerotized, L-shaped, its distal part wider than proximal



Figs 2-7. *Dactylopiastes marginalis* sp. nov., male holotype. (2-3) Right palp, prolateral and retrolateral view, respectively. (4-5) Palpal tibia, dorsal and dorsolateral view, respectively. (6) Distal suprategular apophysis, anterolateral view. (7) Embolic division, ventrolateral view.

one, hooked apically. Distal suprategular apophysis (Fig. 6) highly developed, carrying three processes: proximal one (PP in Figs 2, 6) thin, long, directed backwards; distal one (DP in Figs 2, 6) L-shaped, very wide proximally, spike-shaped distally; lateral process (LP in Figs 2, 6) wide, short, highly sclerotized, with two short, unequal lobes, one distally rounded, the other truncate. Median membrane relatively wide and short. Column practically absent, embolic division situating very close to suprategulum. Radix flat, wide, with a notch in dorsal margin. Distal part of radix at base of embolus bent, carrying a wide, flat outgrowth, its edge in lateral view looking like a well-sclerotized, claw-shaped apophysis (RA in Figs 3, 7). Embolus very thin, short. Abdomen 0.75 long, 0.53 wide, dorsally almost white, with a longitudinal row of three pairs of indistinct, grey spots as shown in Fig. 1.

Female. Unknown.

Taxonomic remarks: *Dactylopisthes separatus* has been described and perfectly illustrated by Zhao & Li (2014) on the basis of females from the extreme south of China. The authors attributed the species to the genus tentatively, and noted that the epigyne of this species resembles that of *D. locketi* (Tanasevitch, 1983), known from the Tian Shan Mts, Uzbekistan (Tanasevitch, 1983). I also doubt that *D. separatus* belongs to *Dactylopisthes*, but even if not, the holotype of new species cannot be the conspecific male of the *D. separatus* types since these females are characterized by a specific coloration of the body. The male of *D. marginalis* sp. nov. has a completely different color pattern, see Fig. 1 and fig. 30B in Zhao & Li (2014). In most cases males and females of the same species have a similar color pattern of the body.

Distribution: Known only from the type locality in western central Thailand.

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New combination and redescription of *Brachyponera mesoponeroides* Radchenko, 1993 (Hymenoptera: Formicidae: Ponerinae)

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Abstract: Two paratype workers of *Brachyponera mesoponeroides* Radchenko, 1993 were examined. As the result, this species disagreed with *Brachyponera* but well agreed with *Hypoponera* in some important diagnostic characters separating the two genera: the apicoventral part of metatibia without a small and simple spur in front of a large and pectinate spur; outer basal portion of mandible without the pit or groove; prora present; subpetiolar process as a rounded lobe, lacking a posterior shelf-like process. Therefore, *B. mesoponeroides* was transferred to the genus *Hypoponera* as a new combination *Hypoponera mesoponeroides*. Then the worker of this species was re-described, and the queen was described for the first time based on the paratype workers and nest series newly collected from Cuc Phuong National Park, Ninh Binh province (type locality), Van Lang district, Lang Son province and Na Hang Natural Reserve, Tuyen Quang province, Vietnam. COI-based DNA barcoding was also conducted for examining the species boundaries of *Hypoponera mesoponeroides*.

Keyword: Ant - *Hypoponera mesoponeroides* - queen - DNA barcoding.

INTRODUCTION

Brachyponera was established by Emery (1900) as a subgenus of the genus *Euponera* Forel, 1891, with the type species *E. (B.) croceicornis* (Emery, 1900), and raised to full genus level by Bingham (1903). Later, *Brachyponera* was synonymized under the genus *Pachycondyla* F. Smith, 1858 by Snelling (1981). This treatment was supported by Brown (in Bolton, 1994), and widely accepted until Schmidt (2013) and Schmidt & Shattuck (2014) in which *Brachyponera* was revived again as a genus based on molecular phylogenetic analysis and morphological examination.

Radchenko (1993) described a new species, *Brachypone-ra mesoponeroides*, based on workers collected from Cuc Phuong, Ninh Binh, Vietnam, and it was then transferred to *Pachycondyla* by Bolton (1995). Later, Schmidt & Shattuck (2014) revived *Brachyponera* as an independent genus and transferred the species back to *Brachyponera*. In the course of our long-term project revealing species diversity of ants in Indo-China, two paratype workers

of *Brachyponera mesoponeroides* were examined to confirm its generic position, and we have concluded that Radchenko's species disagrees with *Brachyponera* but well agrees with *Hypoponera* in some important diagnostic characters separating the two genera. Therefore, in the present paper, *B. mesoponeroides* is transferred to *Hypoponera* as a new combination. The worker of this species is re-described and the queen is described for the first time based on the paratype workers and nest series newly collected from Cuc Phuong National Park, Ninh Binh province (type locality), Van Lang district, Lang Son province and Na Hang Natural Reserve, Tuyen Quang province, Vietnam. COI-based DNA barcoding was also conducted for examining the species boundary of *Hypoponera mesoponeroides*.

MATERIALS AND METHODS

Abbreviations of the specimen depositories: Abbreviations of the specimen depositories are as follows:

IEBR, Institute of Ecology and Biological Resources, Hanoi, Vietnam; MHNG, Muséum d’histoire naturelle, Geneva, Switzerland; MIZ, Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw, Poland; SKYC, Sk. Yamane collection, Japan.

Specimen Imaging: Images were produced by Helicon Focus Pro 6.7.1 from a series of source images taken using a Lumix DMC GX8 digital camera attached to a Nikon AZ100 (for details see Satria *et al.*, 2015).

Measurements and Indices: The following parts of the bodies were measured using ImageJ (<http://imageJ.nih.gov/ij/>) based on the photographs taken using a Panasonic Lumix DMC-GX8 digital camera attached to the Nikon AZ100 microscope under suitable magnifications. The measurements and indices basically follow those in Bolton & Fisher (2011).

- HLHead Length: length of head capsule excluding the mandibles, measured in full-face view in a straight line from the mid-point of anterior clypeal margin to the mid-point of the posterior margin of head.
- HWHead Width: maximum width of head including eyes, measured in full-face view.
- HSHead Size: HL + HW, divided by 2.

- SLScape Length: maximum straight-line length of scape, excluding the basal constriction or neck that occurs just distal of condylar bulb.
- MLLength of closed mandible in full-face view from apex to midpoint of clypeal margin.
- ELEye length: maximum length of compound eye, measured along the maximum diameter.
- PrWPronotal Width: maximum width of pronotum in dorsal view.
- WLWeber’s Length of Mesosoma: diagonal length of mesosoma in lateral view, from the angle at which the pronotum meets cervix to the posterior basal angle of metapleuron.
- PeHPetiole Height: vertical height of petiole, measured in lateral view from the lowest point of subpetiolar process to a line that intersects the highest point of the dorsal outline.
- PeNLPetiole Node Length: in lateral view, the maximum length of petiole node, measured in a straight horizontal line from immediately above the dorsal base of the anterior petiolar tubercle to the posterior margin.
- PeNWPetiole Node Width: The maximum width of petiole node in dorsal view.
- PeSPetiole Size: PeH + PeNL + PeNW, divided by 3.

Table 1. List of specimens used for COI-based DNA bacoding, with DDBJ/Genbank accession number. CP., Cuc Phuong National Park, Ninh Binh, Vietnam; VL., Van Lang, Lang Son, Vietnam; NH, Na Hang Nature Reserve, Tuyen Quang, Vietnam; CYS, Chu Yang Sin National Park, Dak Lak, Vietnam.

Species	Specimen code	Colony code	Locality	Accession Number
<i>Hypoponera mesoponeroides</i>	AD170511-01	AD17CP37	CP	LC349909
<i>Hypoponera mesoponeroides</i>	AD170511-02	AD17CP60	CP	LC349910
<i>Hypoponera mesoponeroides</i>	AD170511-03	AD17CP74	CP	LC349911
<i>Hypoponera mesoponeroides</i>	AD170511-04	AD17CP57	CP	LC349912
<i>Hypoponera mesoponeroides</i>	AD170511-05	AD17CP34	CP	LC349913
<i>Hypoponera mesoponeroides</i>	AD170511-06	AD17CP16	CP	LC349914
<i>Hypoponera mesoponeroides</i>	AD170511-07	AD17CP43	CP	LC349915
<i>Hypoponera mesoponeroides</i>	AD170511-08	ADLS0027	VL	LC349916
<i>Hypoponera mesoponeroides</i>	AD170511-09	AD17CP41	CP	LC349917
<i>Hypoponera mesoponeroides</i>	AD170511-10	AD17CP30	CP	LC349918
<i>Hypoponera mesoponeroides</i>	AD170511-11	AD17CP38	CP	LC349919
<i>Hypoponera mesoponeroides</i>	AD170511-12	AD17CP87	CP	LC349920
<i>Hypoponera mesoponeroides</i>	AD170511-13	AD17CP58	CP	LC349921
<i>Hypoponera mesoponeroides</i>	AD170511-14	AD17CP31	CP	LC349922
<i>Hypoponera mesoponeroides</i>	AD170525-17	Eg13iii15-25	NH	LC349923
<i>Hypoponera mesoponeroides</i>	AD170525-19	Eg13iii15-16	NH	LC349924
<i>Hypoponera</i> sp.1	AD171005-52	AD16-CYS-016	CYS	LC349925
<i>Hypoponera</i> sp.1	AD171005-54	AD16-CYS-119	CYS	LC349926

- CI Cephalic Index: HW divided by HL, × 100.
- MI Mandibular Index: ML divided by HL, × 100.
- SI Scape Index: SL divided by HW, × 100.
- PeNI Petiole Node Index: PeNW divided by PrW, × 100.
- LPeI Lateral Petiole Index: PeNL divided by PeH, × 100.
- DPeI Dorsal Petiole Index: PeNW divided by PeNL, × 100.

DNA barcoding: A single worker of each colony listed in the Table 1 was used for DNA barcoding; the colonies were morphologically determined as *B. mesoponeroides* by comparing them with the two paratype workers of *B. mesoponeroides*. DNA extraction, PCR amplification of the 658bp of the standard DNA barcoding region (Folmer region) near the 5’ terminus of the mitochondrial CO1 gene, sequencing using ABI PRISM 3100 (Applied Biosystems), and sequence assembly using ChromasPro 1.7.6 (Technelysium Pty Ltd., Australia) were conducted by following Satria *et al.* (2015). A total of 18 sequences were submitted to the DNA Data Bank

of Japan (accession numbers: LC349909-LC349926; Table 1). The 18 sequences together with the following five sequences of the three other *Brachyponera* species (*B. chinensis*: GQ264568; *B. luteipes*: GQ264582; *B. nakasujii*: GQ264594; *Cryptopone sauteri*: GQ264538; *Ectomomyrmex javanus* GQ264573) were aligned with using ClustalW (Thompson *et al.*, 1994) built in MEGA 7 (Kumar *et al.*, 2016). Then, based on a 438 bp dataset, pairwise divergences were calculated using p-distance (obtained by dividing the number of nucleotide differences by the total number of nucleotides compared) and the K2P distance model (Kimura, 1980). A neighbor-joining tree based on the K2P distance model was created using MEGA 7 (Fig. 1).

RESULTS AND DISCUSSIONS

Schmidt & Shattuck (2014, p. 77) distinguished the workers of the genera *Brachyponera* and *Hypoponera* by the following character states: outer basal portion of mandible usually with a basal pit (obsolete or vestigial in some species) in *Brachyponera*, but without the pit or

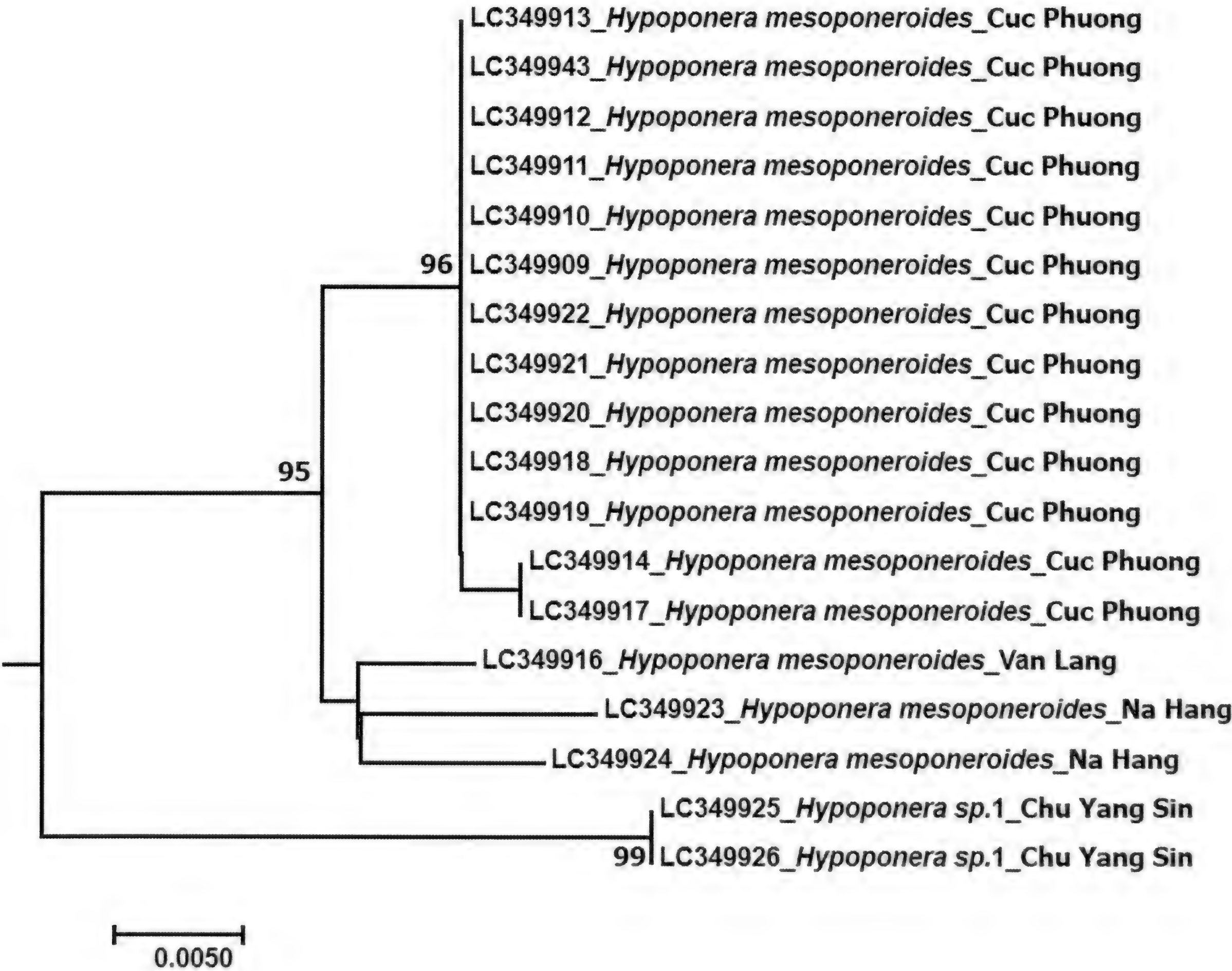


Fig. 1. Neighbor-joining tree generated under the K2P distance model, based on a dataset consisting of 438 bp sequences.

groove in *Hypoponera*; the apicoventral part of metatibia with a small and simple spur in front of a large and pectinate spur in *Brachyponera*, but with a pectinate large spur in *Hypoponera*; prora reduced and not externally visible in *Brachyponera* while present in *Hypoponera*; subpetiolar process well developed, posteroventrally with an acute angle or a pair of acute angles in *Brachyponera*, but as a rounded lobe, lacking a posterior shelf-like process in *Hypoponera*. In our examination, the two paratype workers of *B. mesoponeroides* Radchenko, 1993 agree with the concept of *Hypoponera* proposed by Schmidt & Shattuck (2014); *B. mesoponeroides* is, therefore, transferred to the genus *Hypoponera*.

Through COI-based DNA barcoding, two distinct clusters are recognized within the colonies morphologically determined as “*H. mesoponeroides*” (Fig. 1). The minimal divergences between them are 3.7% in p-distance and 0.038 in K2P. According to previous studies on various arthropoda taxa (Smith *et al.*, 2005 for Formicidae; Robinson *et al.*, 2009 for spiders; Renaud *et al.*, 2012 for Diptera) suggested that intraspecific divergence values of COI are usually less than 2-3%. And so, there is a certain possibility that the two clusters are different at the species level. Consequently, the cluster comprising the colonies from Cuc Phuong (type locality), Van Lang and Na Hang is herein determined as the real *H. mesoponeroides* (maximum intraspecific diversity: 0-1.8% in p-distance and 0-0.019 in K2P), and the queen is described for the first time based on the colonies from Cuc Phuong. The status of the other cluster, consisting of the colonies collected from Chu Yang Sin, will be solved after further intensive sampling in the whole of Vietnam and analyzing the samples.

TAXONOMIC TREATMENT AND REDESCRIPTION

Hypoponera mesoponeroides (Radchenko, 1993) comb. nov.

Figs 2-5

Brachyponera mesoponeroides Radchenko, 1993: 81. – Schmidt & Shattuck, 2014: 80.

Pachycondyla mesoponeroides. – Bolton, 1995: 307.

Type materials examined: *Brachyponera mesoponeroides*; MIZ; 2 paratype workers; Vietnam, Ninh Binh, Cuc Phuong; 05.06.1966; R. Bielawski & B. Pisarski leg.

Nontype materials examined: IEHR; Vietnam, Ninh Binh, Cuc Phuong, 20.29472°N 105.64500°E - 20.30250°N 105.65611°E, ca. 231 m alt.; 1 worker (colony AD17CP16), 1 worker (AD17CP30), 1 worker, 1 dealate queen (AD17CP31), 1 worker (AD17CP34), 1 worker (AD17CP37), 1 worker (AD17CP38), 1 worker (AD17CP41), 1 worker (AD17CP43); 22.03.2017; Dang V.A. leg. – MHNG; Vietnam, Ninh Binh, Cuc Phuong, 20.29472°N 105.64500°E

- 20.30250°N 105.65611°E, ca. 231 m alt.; 1 worker (colony AD17CP16); 22.03.2017; Dang V.A. leg. – IEHR; Vietnam, Ninh Binh: Cuc Phuong, 20.35000°N 105.57805°E - 20.35861°N 105.59333°E, ca. 366 m alt.; 1 worker, 1 dealate queen (AD17CP57), 1 worker (AD17CP58), 1 worker (AD17CP60), 1 worker (AD17CP74); 23.03.2017; Dang V.A. leg. – MHNG; Vietnam, Ninh Binh: Cuc Phuong, 20.35000°N 105.57805°E - 20.35861°N 105.59333°E, ca. 366 m alt.; 1 worker (AD17CP74); 23.03.2017; Dang V.A. leg. – IEHR; Vietnam, Ninh Binh, Cuc Phuong, 20.35861°N 105.59333°E, 212 m alt.; 1 worker (AD17CP87); 24.03.2017; Dang V.A. leg. – MHNG; Vietnam, Ninh Binh, Cuc Phuong, 20.35861°N 105.59333°E, 212 m alt.; 1 worker (AD17CP87); 24.03.2017; Dang V.A. leg. – IEHR; Vietnam, Tuyen Quang, Na Hang Nature Reserve, Ban Chu; limestone forest; 22.49389°N 105.42111°E, 90-185 m alt.; 1 worker (Eg13iii15-16), 1 worker (Eg13iii15-25); 13.03.2015; Eguchi K. leg. – IEHR; Vietnam, Lang Son, Van Lang, 20.39055°N 105.86889°E, 967 m alt.; 1 worker (ADLS0027); 21.04.2016; Dang V.A. leg. – MHNG; Vietnam, Lang Son, Van Lang, 20.39055°N 105.86889°E, 967 m alt.; 1 worker (ADLS0027); 21.04.2016; Dang V.A. leg.

Worker measurements and indices (nontypes, n=10): HL 0.85-0.93 mm; HW 0.77-0.85 mm; HS 0.81-0.89 mm; SL 0.71-0.79 mm; ML 0.31-0.34 mm; EL 0.07-0.10 mm; PrW 0.56-0.62 mm; WL 1.18-1.36 mm; PeH 0.58-0.69 mm; PeNL 0.26-0.28 mm; PeNW 0.38-0.41 mm; PeS 0.41-0.46 mm; ML 0.37-0.43 mm; CI 89-91; MI 33-38; SI 91-98; PeNI 64-69; LpeI 41-47; DPeI 136-154.

Worker description (Figs 2-4): Head in full-face view subrectangular, distinctly longer than wide, with posterior margin very weakly concave or almost straight, with lateral margin weakly convex, in lateral view with dorsal margin straight and ventral margin slightly convex; mandible triangular; masticatory margin of mandible with large apical and two distinct preapical teeth followed by a series of smaller teeth; outer basal portion of mandible without a pit or groove; median portion of clypeus produced anteriad, with anteromedian margin weakly concave; compound eye located on the side of head close to the mandibular insertion, small (EL 0.07-0.10 mm), consisting of 12-16 ommatidia in total; antenna 12-merous; antennal scape when laid backward extending beyond posterolateral corner of head by length of antennal segment II; II almost as long as total length of III and IV; III-V almost identical in length; VI-XII gradually increasing in length towards apex, not forming a distinct club. Pronotum in lateral view with steep anterodorsal outline; mesonotum in lateral view slightly convex; promesonotal suture and mesonotal-mesopleural suture distinct; metanotal groove conspicuous across mesosomal dorsum, deeply incised; mesopleuron not divided by distinct transverse

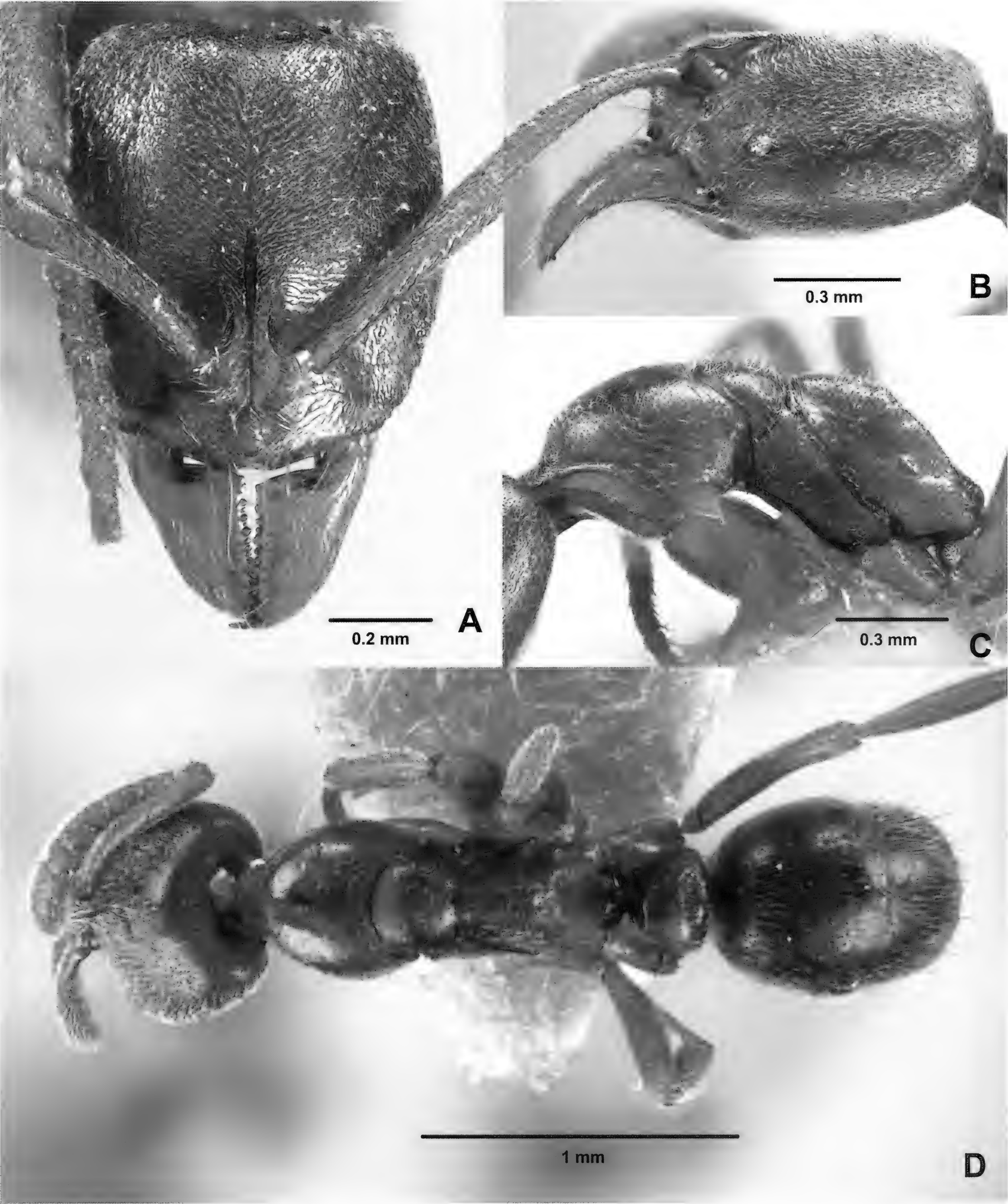


Fig. 2. *Hypoponera mesoponeroides* (Radchenko, 1993) comb. nov., paratype workers. (A) Head in full-face view. (B) Head in lateral view. (C) Mesosoma in lateral view. (D) Body in dorsal view. (B), (C), (D) specimen code: IMG20160605-01; (A) IMG20160605-02.

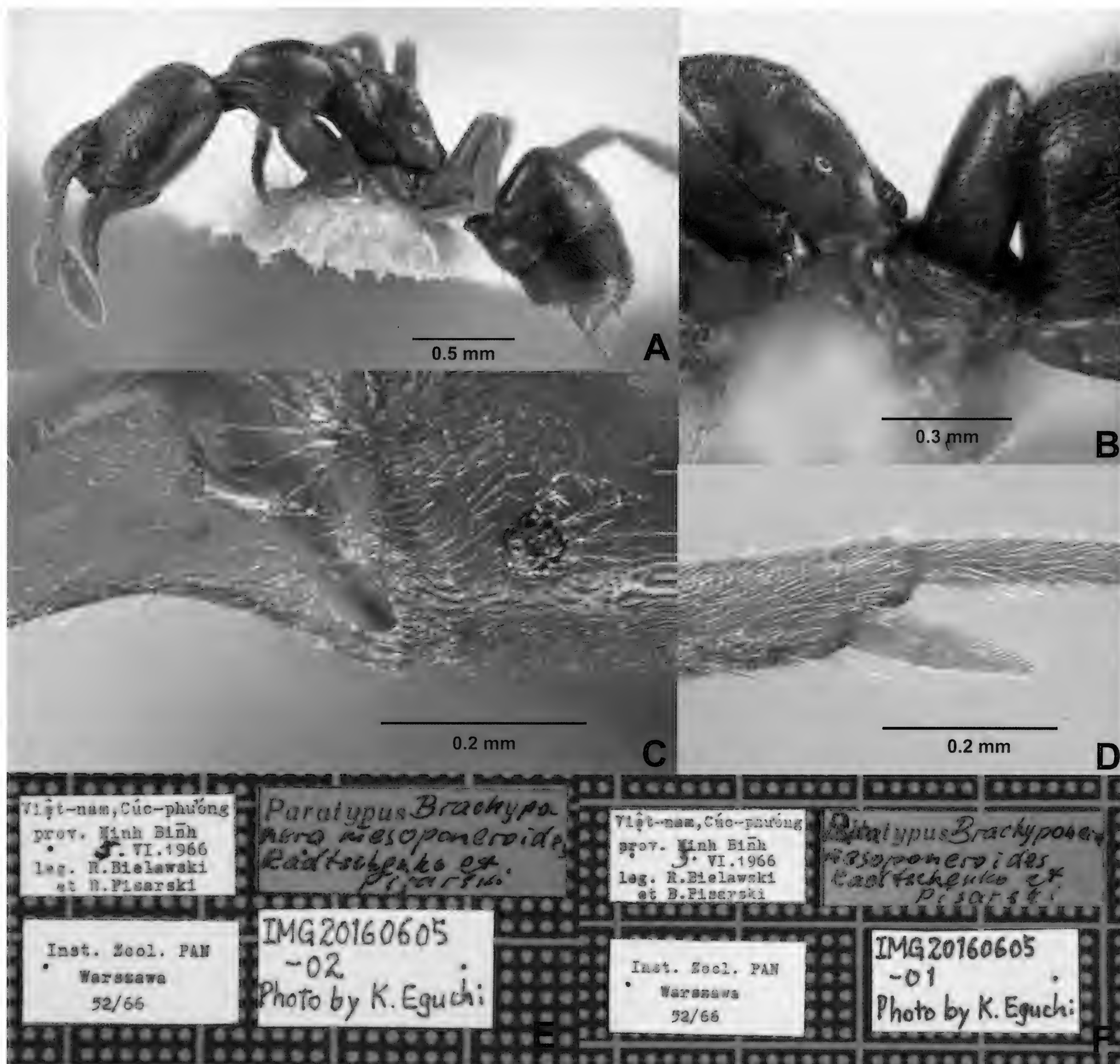


Fig. 3. *Hypoponera mesoponeroides* (Radchenko, 1993) comb. nov., paratype workers. (A) Body in lateral view. (B) Petiole in lateral view. (C) Mandible and gena in lateral view. (D) Metatibial spur. (E), (F) Labels of a paratype. (A), (F) specimen code: IMG20160605-01; (B), (C), (D), (E) IMG20160605-02.

sulcus; meso-metapleural suture distinct; propodeum in lateral view with dorsum short and faintly convex or almost straight, and posterior declivity almost straight; propodeal spiracle elliptical; propodeal lobe absent; apicoventral part of meso- and metatibia with a single pectinate spur. Petiolar node in lateral view squamiform and thin; subpetiolar process developed well as a lobe, without an anterior fenestra, in lateral view with a weak concavity on the ventral margin, without a posterior shelf-like process. Abdominal tergite III as long as or slightly longer than IV. Prora present as a distinct U-shaped ridge below helcium.

Head, pronotum, mesonotum and dorsum of propodeum

and petiole entirely covered with fine, hair-bearing punctures; mandible smooth; mesopleuron largely smooth and shiny; metapleuron largely smooth and shiny, with posteriormost part finely striate; pretergite IV almost smooth and shiny, with fuzzy transverse striations. Body covered with appressed to subdecumbent background pubescence which is sparser in mesopleuron and metapleuron than in the remainder of body; clypeus with several erect setae; compound eye with short hairs between ommatidia; antenna covered relatively desely with very short, appressed to suberect pubescence; abdominal segments III-VII with many erect to suberect setae among background pubescence.

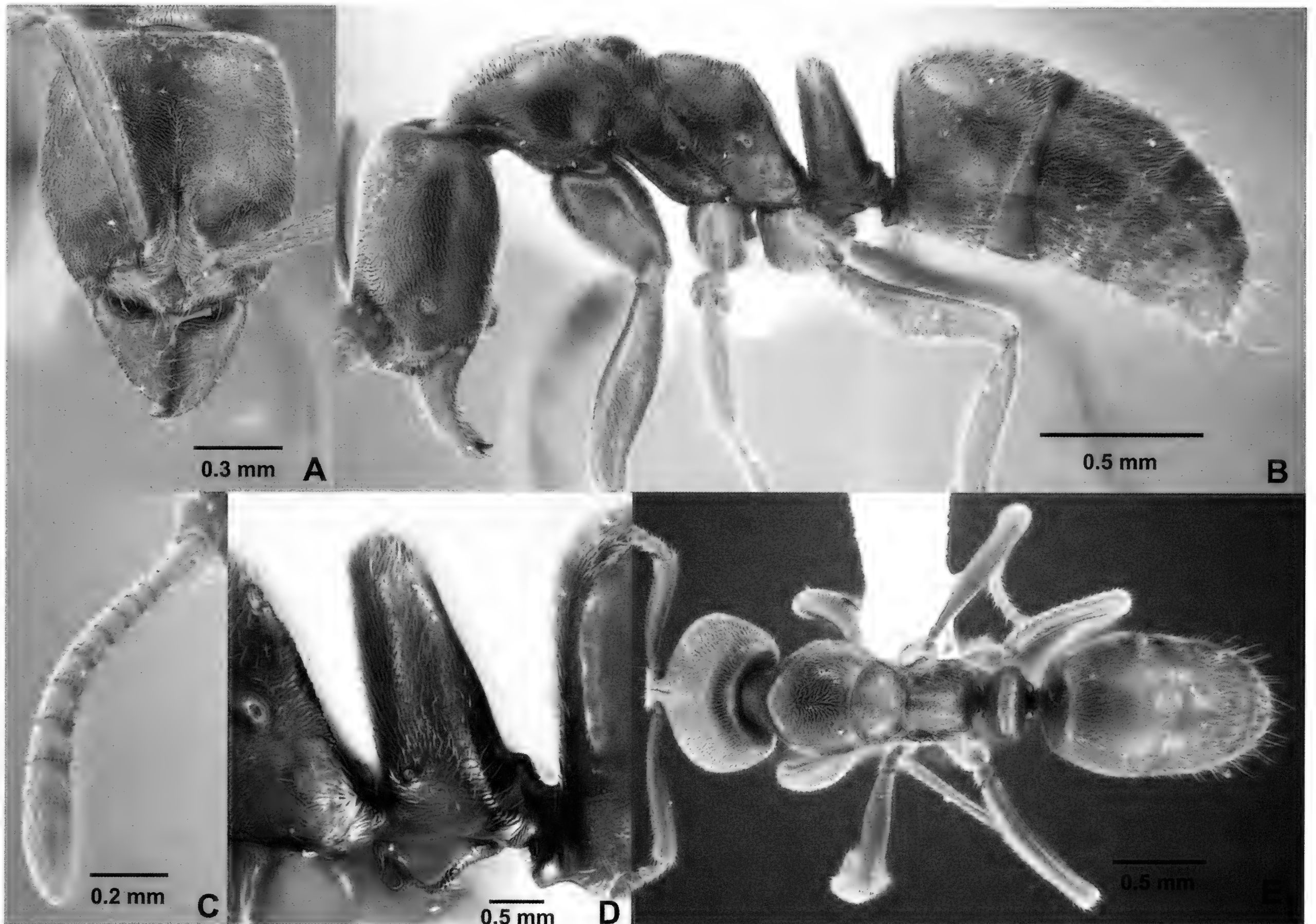


Fig. 4. *Hypoponera mesoponeroides* (Radchenko, 1993) comb. nov., nontype worker. (A) Head in full-face view. (B) Body in lateral view. (C) Antenna. (D) Petiole. (E) Body in dorsal view. (A), (B), (C), (D) colony code: AD16CP60, specimen code: CAP20171220-01; (E) AD16CP58, CAP20170714-01.

Body dark-brown to reddish brown; mandibles, antenna and legs paler.

Queen measurements and indices (n=2): HL 0.98-0.99 mm; HW 0.88 mm; HS 0.93-0.94 mm; SL 0.84-0.87 mm; ML 0.38-0.4 mm; EL 0.20-0.22 mm; PrW 0.77-0.78 mm; WL 1.65-1.67 mm; PeH 0.79-0.80 mm; PeNL 0.36-0.37 mm; PeNW 0.46-0.48 mm; PeS 0.54-0.55 mm; ML 0.47-0.48 mm; CI 95; MI 48; SI 90-93; PeNI 60-62; LpeI 46; DPeI 128-130.

Queen description (Fig. 5): In general appearance queen similar to worker. Body larger than in the worker; gaster sometimes distinctly larger than in the worker. Compound eye large (EL 0.20-0.22 mm), with short hairs between ommatidia (Fig. 5C); ocelli present; distance between median and lateral ocelli as long as distance between lateral ocelli. Mesosoma with main sclerites associated with wing function (Fig. 5B); mesoscutum with conspicuous parapsidal lines, without notauli, in lateral view with slightly convex anterodorsal outline; dorsal outline of mesonotum in lateral view weakly depressed between mesoscutum

and mesoscutellum; mesopleuron with a well-developed transverse sulcus that divides it into upper and lower portions; propodeum in lateral view with dorsum short and gradually sloping posteriad, and posterior declivity almost straight. Apical part of petiolar node in lateral view tapering sharply more than in the worker.

Bionomics: This species inhabits in secondary and primary forests from the lowland to the highland (up to an approximately 1,000 m alt.), and nests in the leaf litters, soil, rotting logs and rotting wood fragments, and under rocks.

Distribution: Known from northern Vietnam.

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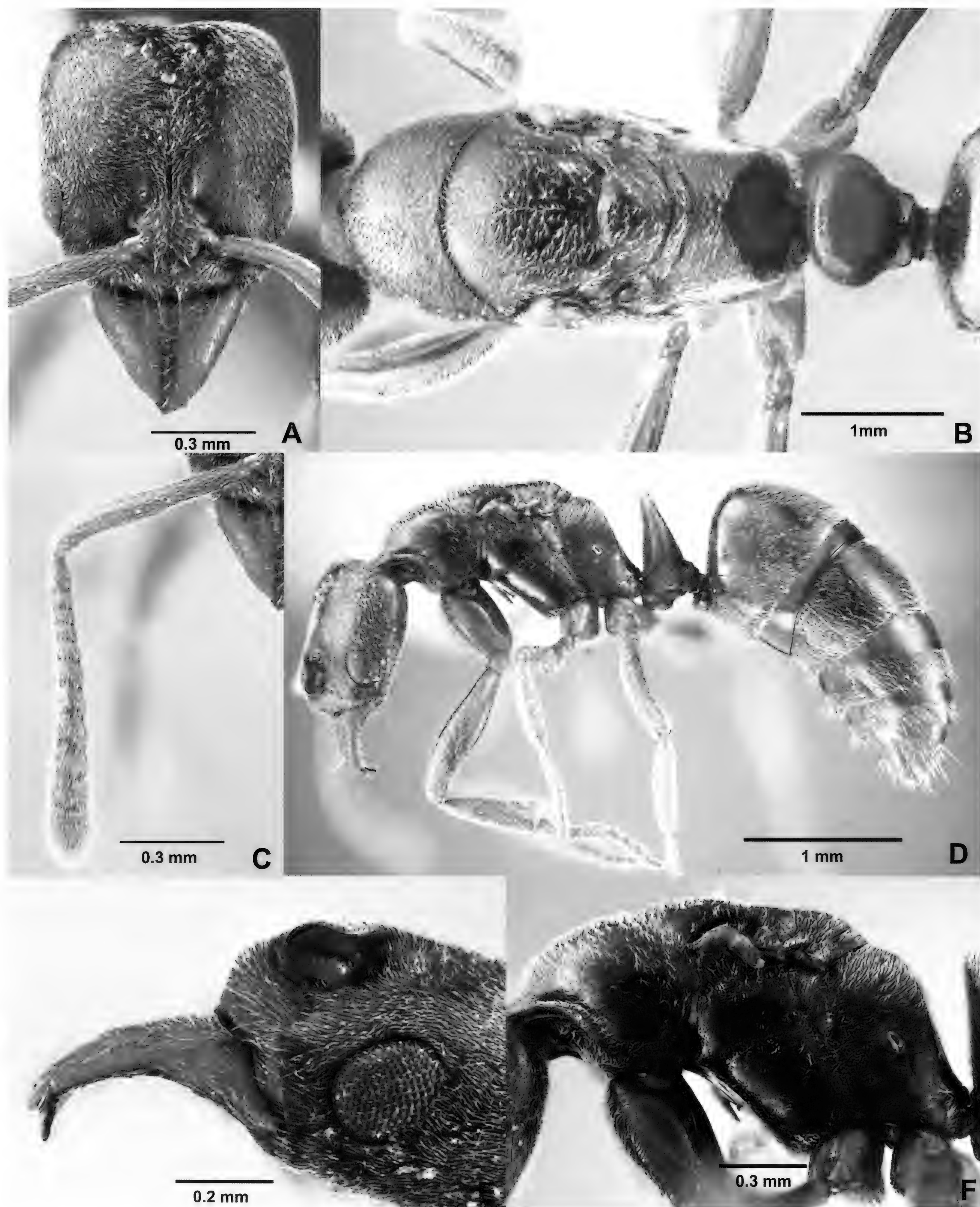


Fig. 5. *Hypoponera mesoponeroides* (Radchenko, 1993) comb. nov., nontype queen, colony code: AD16CP57; specimen code: CAP20170716-01. (A) Head in full-face view. (B) Body in dorsal view. (C) Antenna. (D) Body in lateral view. (E) Compound eye. (F) Mesosoma in lateral view.

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First record of the Vietnam Flying Frog, *Rhacophorus calcanus* Smith, 1924, from Khanh Hoa Province, including the first molecular identification and morphological description of larval stages

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Abstract: We herein report the first record of the Vietnam Flying Frog, *Rhacophorus calcanus* Smith, 1924, which is previously known only from Dak Lak and Lam Dong provinces, from Hon Ba Nature Reserve, Khanh Hoa Province, Vietnam. We further describe the larval morphology of the species for the first time, based on a tadpole collection from Hon Ba which was genetically matched with topotypic metamorphosed *Rhacophorus* and *R. calcanus* from Dak Lak Province. Morphological characters of the tadpoles (Gosner stages 32, 36, 37 and 41) are as follows: Body and tail brown with numerous dark spots, ventral surface whitish. Body medium-sized, slightly depressed, elliptical in shape. Eyes of moderate size, located dorsolaterally. In lateral view, spiracle single, sinistral; lower and upper tail fin nearly of same size. Oral disc anteroventrally positioned, of trapezoidal shape and laterally emarginated, surrounded by papillae. Keratodont row formula (LTRF): 7(2-7)/3(1). Larvae are exotrophic, lentic: benthic; larval type after Orton (1953) is type IV.

Keywords: Rhacophoridae - *Rhacophorus calcanus* - DNA barcoding - tadpole description - Vietnam - Tay Nguyen Plateau.

INTRODUCTION

The Vietnam Flying Frog, *Rhacophorus calcanus* Smith, 1924, is endemic to the Annamite Mountains of southern Vietnam (type locality: Langbian peaks, see Smith, 1924). The taxonomic history of the *R. calcanus* species group is complicated (Orlov *et al.*, 2012). *R. calcanus* was previously extensively confused with the recently described *R. robertingeri* (Inger *et al.*, 1999), and another recently described species, *R. chuyangsinensis* (Orlov *et al.*, 2008), which was subsequently synonymized with *R. calcanus* (Orlov *et al.*, 2012). According to Frost

(2017), the latter species is known with certainty only from Chu Yang Sin National Park, Krong Bong and Lak districts, Dak Lak Province, and from Bidoup - Nui Ba National Park, Lam Dong Province. Because of the complicated taxonomic history, not much is known about the natural history of *R. calcanus* sensu stricto (Van Dijk & Nguyen, 2009). We herein report the species for the first time from Khanh Hoa Province. Based on tadpoles collected in Hon Ba Nature Reserve, which were genetically matched with topotypic metamorphosed frogs and *R. calcanus* from Dak Lak Province (Nguyen

et al., 2014) and subsequently identified as *R. calcanus* we herein further describe the larval morphology of the species for the first time.

MATERIAL AND METHODS

Material examined: Collected specimens were deposited in the herpetological collection of the Vietnam National Museum of Nature (VNMN), Vietnam Academy of Science and Technology in Hanoi. One adult male (VNMN 06317), one adult female (VNMN 0965), one juvenile (VNMN 0969) and six *Rhacophorus* tadpoles (VNMN 06318-06323) were collected in Hon Ba Nature Reserve, Khanh Hoa Province, Vietnam. Two adult males of *R. calcanus* (VNMN 0608, 0610) from Chu Yang Sin National Park, Dak Lak Province, Vietnam (Nguyen *et al.*, 2014) served for morphological and molecular comparisons (Table 1).

Molecular analysis: For the molecular analysis we used the protocols of Kuraishi *et al.* (2013), modified by Nguyen *et al.* (2014), for DNA extraction, amplification, and sequencing. Fragments of the mitochondrial DNA gene 16S rRNA was amplified using the primers following Kuraishi *et al.* (2013). Chromas Pro software (Technelysium Pty Ltd., Tewantin, Australia) was used to edit the sequences, which were aligned using MAFFT version 7 (Kato & Standley, 2013) with default setting (FFT-NS-2 algorithm). We then checked the initial alignments by eye. Phylogenetic trees were constructed by using maximum likelihood (ML) and Bayesian

inference (BI). Prior to ML and Bayesian analyses, the optimum substitution models for the 16S rRNA partition was selected by Kakusan 4 (Tanabe, 2011), based on the Akaike information criterion (AIC). We performed ML analyses with Treefinder version March 2011 (Jobb, 2011), while we estimated BI and Bayesian posterior probabilities (BPP) with MrBayes v.3.2.1 (Ronquist & Huelsenbeck, 2003). The best model selected for ML was the general time reversible model (GTR: Tavaré, 1986) with a gamma shape parameter (G: 0.255 in ML and 0.259 in BI). The BI summarized two independent runs of four Markov Chains for 10,000,000 generations. A tree was sampled every 100 generations and a consensus topology was calculated for 70,000 trees after discarding the first 30,001 trees (burn-in = 3,000,000). We checked parameter estimates and convergence using Tracer version 1.5 (Rambaut & Drummond, 2009). The strength of nodal support in the ML tree was analyzed using non-parametric bootstrapping (MLBS) with 1,000 replicates. We regarded tree nodes in the ML tree with bootstrap values of 75% or greater as sufficiently supported (Hillis & Bull, 1993), and nodes with a BPP of 95% or greater as significant in the BI analysis (Leaché & Reeder, 2002). Pairwise comparisons of uncorrected sequence divergences (p-distance) were calculated for 16S rRNA fragments. Resulting DNA sequences from this analysis were submitted to GenBank (Accession Numbers: LC375231 to LC375239; Table 1). For tadpole matching and specific identification, sequences of the 16S rRNA of the tadpoles from Hon Ba Nature Reserve, Khanh Hoa Province, were compared with

Table 1. Samples of Vietnamese *Rhacophorus* and other rhacophorid species used for DNA analysis in this study together with information on voucher, collection locality and GenBank accession numbers. Voucher abbreviations: KIZ = Kunming Institute of Zoology; KUHE = Graduate School of Human and Environmental Studies, Kyoto University; VNMN = Vietnam National Museum of Nature.

Sample No.	Species	Voucher	Locality	Accession No.	Reference
1.	<i>Rhacophorus calcanus</i>	VNMN 4096	Vietnam, Dak Lak, Chu Yang Sin	LC010573	Nguyen <i>et al.</i> (2014)
2.	<i>R. calcanus</i>	VNMN 4097	Vietnam, Dak Lak, Chu Yang Sin	LC010574	Nguyen <i>et al.</i> (2014)
3.	<i>R. calcanus</i>	VNMN 6317	Vietnam, Khanh Hoa, Hon Ba	LC375239	This study
4.	<i>R. calcanus</i>	VNMN 0965	Vietnam, Khanh Hoa, Hon Ba	LC375237	This study
5.	<i>R. calcanus</i>	VNMN 0969	Vietnam, Khanh Hoa, Hon Ba	LC375238	This study
6.	Tadpole 01	VNMN 6318	Vietnam, Khanh Hoa, Hon Ba	LC375231	This study
7.	Tadpole 02	VNMN 6319	Vietnam, Khanh Hoa, Hon Ba	LC375232	This study
8.	Tadpole 03	VNMN 6320	Vietnam, Khanh Hoa, Hon Ba	LC375233	This study
9.	Tadpole 04	VNMN 6321	Vietnam, Khanh Hoa, Hon Ba	LC375234	This study
10.	Tadpole 05	VNMN 6322	Vietnam, Khanh Hoa, Hon Ba	LC375235	This study
11.	Tadpole 06	VNMN 6323	Vietnam, Khanh Hoa, Hon Ba	LC375236	This study
12.	<i>R. reinwardtii</i>	KIZ-Rao081205	Malaysia	JX219443	Li <i>et al.</i> (2012)
13.	<i>Kurixalus odontotarsus</i>	KIZ 201307012	China, Yunnan	AB933302	Nguyen <i>et al.</i> (2014)

these from topotypic adults and a topotypic juvenile together with one male and one female of *R. calcanus* from Chu Yang Sin National Park, Dak Lak Province (Nguyen *et al.*, 2014). Morphological identification of adult frogs followed Smith (1924), Orlov *et al.* (2008, 2012) and Tran *et al.* (2011).

Morphological analysis: Terminology for morphometric data and abbreviations followed Altig & McDiarmid (1999) and Grosjean (2005). Tadpoles were staged according to Gosner (1960). The labial tooth row formula (LTRF) was determined according to Altig & McDiarmid (1999) and for general larval types see Orton (1953). Tadpoles were photographed alive in a cuvette, subsequently euthanized with ethyl acetate and preserved in 70% ethanol. Prior to preservation, a piece of the lower tail fin and tail musculature was taken from each tadpole and preserved in a 98% ethanol solution for further genetic analysis.

The measurements were taken with a dial calliper to the nearest 0.1 mm. Abbreviations are as follow: BH: maximum body height; BL: body length; BW: maximum body width; HT: maximum tail height; LF: maximum height of lower tail fin; IND: internarial distance (measured between centers of narial apertures); PP: interpupilar distance (measured between centers of pupils); RND: rostro-narial distance (measured between the tip of the snout and the center of the nostril); SS: distance from tip of snout to opening of spiracle; SU: distance from the tip of snout to insertion of upper tail fin; TL: total length; TAL: tail length; UF: maximum height of upper tail fin; VT: distance from vent to tip of tail; TMH: height of the tail musculature at base; TMW: width of tail musculature at base; FL: forelimb length; HLL: hindlimb length; SVL: Snout-vent length; ODW: oral disc width; ED: maximum diameter of eye (horizontal); LTRF: Labial Tooth Row Formula with A (number of rows on anterior labium) and P (number of rows on posterior labium); NPD: nario-pupilar distance (measured between the center of the nostril and the center of the pupilla).

RESULTS

Phylogenetic analyses: Aligned, combined sequences of 16S rRNA yielded a total of 457 characters. Of 457 nucleotide sites, 2 were variable within the in-group. The ML and Bayesian analyses produced topologies with $-\ln L = 1029.838$ and 1057.656 , respectively. Phylogenetic analyses employing ML and BI methods yielded identical topologies, and only the ML tree is presented (Fig. 1).

The comparisons of the resulting 457 bp long fragment of the 16S rRNA between the tadpoles and the topotypic frogs from Hon Ba Nature Reserve, Khanh Hoa Province, Vietnam, and adults from Chu Yang Sin National Park, Dak Lak Province, Vietnam and, showed only a negligible single base pair difference (corresponding to 0.4%), and

thus an unambiguous specific assignment of the tadpoles both to the topotypic frogs and adult *R. calcanus* from Dak Lak Province is guaranteed. Furthermore, the adults from Hon Ba Nature Reserve morphologically well agreed with the original description of *R. calcanus* provided by Smith (1924), and with subsequent reviews (Orlov *et al.*, 2008; Tran *et al.*, 2011; Orlov *et al.*, 2012), as well as with adults from Chu Yang Sin National Park, Dak Lak Province, from where *R. calcanus* already was proven to occur with certainty. Thus the identity of the tadpoles from Hon Ba Nature Reserve to represent *R. calcanus* is sufficiently proven.

Morphological analysis: The collected tadpoles from Hon Ba Nature Reserve, Khanh Hoa Province, Vietnam were in the developmental stages 32, 36, 37, 41, and 42 according to Gosner (1960) (Tabs 2-3, Figs 2-3). Larvae are exotrophic, lentic: benthic; larva type IV after Orton (1953); for comparisons with larvae of other *Rhacophorus* species occurring in Vietnam (Tab. 4).

In the following we provide a detailed description of a larva of *Rhacophorus calcanus* at stage 32 (VNMN 06318).

Dorsal view: Body somewhat elliptically protracted, with a slightly pointed snout; widest portion being at midbody; maximum body width 0.68 times of body length (BW 11.48 mm; BL 16.86 mm). Nares small, rounded, positioned dorsolaterally in anterolaterally direction; naris closer to the pupil than to the tip of snout, rostro-narial distance 1.11 times of nario-pupilar distance (RND 3.2 mm; NPD 2.88 mm); internarial distance about 0.44 of interpupilar distance (IND 2.83 mm; PP 6.34 mm). Eyes of moderate size (ED 1.36 mm); eye diameter 0.12 times of maximum body width and 0.08 times of body length, positioned dorsolaterally, directed more laterally than anteriorly, slightly bulging. The tail musculature is of moderate size, tail muscle width 0.28 times of body width (TMW 3.19 mm; BW 11.48 mm).

Lateral view: Body slightly depressed, body height 0.5 times of body length (BH 8.51 mm; BL 16.86 mm); spiracle single, sinistral, ventrolaterally positioned at midbody, oriented in posterodorsal direction and entirely attached to the body; opening of the spiracle oval. Distance from tip of snout to opening of spiracle 0.6 times of body length (SS 10.05 mm; BL 16.86 mm).

Tail tapered and long; body length 0.64 times of tail length (BL 16.86 mm; TAL 26.26 mm); tail musculature moderately developed; maximum height of tail musculature 0.67 times body height and 0.46 times maximum tail height (TMH 5.7 mm; BH 8.51 mm; HT 12.43 mm). Tail musculature from the proximal to its distal half in parallel, then gradually tapering, reaching the tip of the tail. Upper and lower tail fins almost equal in size (LF 4.15 mm; UF 4.16 mm), enlarged, maximum at the end of tail; tip of tail rounded; distance from tip of snout to insertion of upper tail fin 0.83 times body length (SU 13.99 mm; BL 16.86 mm); maximum height of upper

and lower tail fin 0.33 times of maximum tail height (UF 4.16 mm; LF 4.15 mm; HT 12.43 mm). Vent tube dextral, located directly at end of body between limbs; posterior part of vent tube coadunate with lower tail fin, moderate size, margin thick.
Lateral line organ present and well developed on body and along the apex of the caudal musculature.
Oral disc: Anteroventrally positioned, of nearly triangular shape in expanded state (see Fig. 2), and laterally emarginated; two short rows of papillae situated laterally

of the lower labium and margin of the mouth present, which is restricted by two side corners of the mouth; absence of papillae on margin of the upper labium; lower lip with medial gap; in preservative, tip of the papillae rounded, white; base of the papillae brown. Jaw sheaths black and convex; both upper and lower jaw sheaths serrated; upper jaw sheath semicircular and narrow, and stretched into a wide arch; lower jaw sheath V-shaped. Mouth part medium-sized (ODW 3.8 mm); oral disc width 0.33 times of maximum body width and 0.23

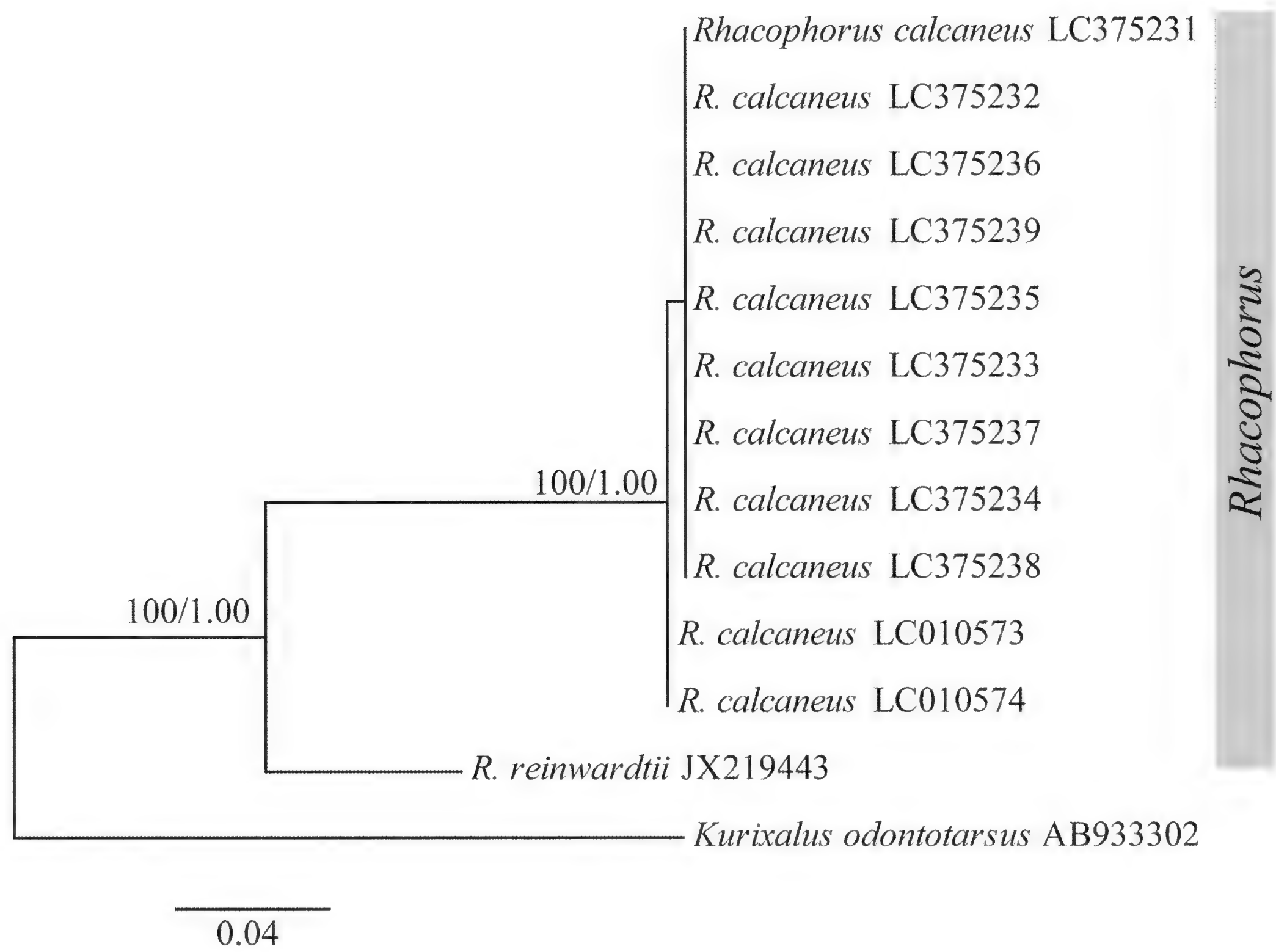


Fig. 1. Maximum-likelihood (ML) and Bayesian inference (BI) tree based on the partial 16S rRNA mitochondrial gene. Numbers above and under branches are ML bootstrap values and Bayesian posterior probabilities.

Table 2. Developmental stages, total length in mm and morphological characters of the six collected larvae of *Rhacophorus calcanus* from Hon Ba Nature Reserve, Khanh Hoa Province; stage diagnostic characteristics according to Gosner (1960) are italicized.

Stage	n	TL (mm)	Morphological characters
32	1	42.79	<i>Indentation between toes 4 and 5</i>
36	1	47.37	<i>Toes 3-5 separated</i>
37	1	54.7	<i>Toes well developed and fully separated</i>
41	2	54.02	<i>Mouth parts atrophy</i> ; tongue well developed; <i>fore limbs visible under the skin</i> ; hind limbs without metatarsal tubercle, toe discs start to develop; <i>reduction of upper and lower tail fins</i> ;
		54.05	eye convex, eyelid distinct; <i>atrophy of vent tube</i> ; cloaca appears between hind limbs, close to tail base
42	1	52.64	<i>Keratodonts and jaw sheaths disappeared</i> ; tongue completely developed; eye enlarged; <i>fore limbs with four fingers emerged</i> ; spiracle disappeared; <i>tail further atrophied</i>

Table 3. Measurements (in mm) of the six collected larvae of *Rhacophorus calcaneus* from Hon Ba Nature Reserve, Khanh Hoa Province; for abbreviations see Material & Methods.

	Stage	BH	BL	BW	HT	LF	IND	PP	NPD	RND	SS	SU
VNMN 6318	32	8.51	16.86	11.48	12.43	4.15	2.83	6.34	2.88	3.2	10.05	13.99
VNMN 6321	36	8.11	16.99	9.95	12.1	4.22	2.86	5.95	3	2.99	8.5	15.52
VNMN 6320	37	6.97	17.91	8.9	11.43	3.74	3.05	5.42	3.4	3.03	9.49	16.65
VNMN 6319	41	5.61	16.89	10.72	10.37	3.28	2.48	5.97	3.68	2.38	10.58	15.14
VNMN 6323	41	6.22	17.44	10.62	9.07	2.98	2.51	5.62	3.09	2.87	10.98	14.65
VNMN 6322	42	6.11	17.56	9.61	6.22	1.66	2.77	6.14	3.68	1.7	-	18.92

	Stage	TL	TAL	UF	VT	TMH	TMW	FL	HLL	SVL	ODW	ED
VNMN 6318	32	42.79	26.26	4.16	21.48	5.7	3.19	-	1.7	18.74	3.8	1.36
VNMN 6321	36	47.37	31.79	4.23	29.01	5.26	3.77	-	2.17	18.88	4.11	1.75
VNMN 6320	37	54.7	37.17	4.14	34.63	5.07	3.9	-	8.16	20.77	4.22	2.23
VNMN 6319	41	54.02	39.49	3.91	36.83	4.88	3.3	-	25.56	17.72	3.21	2.61
VNMN 6323	41	54.05	38.2	4.44	36.3	4.56	4.39	-	23.43	18.72	3.54	3.2
VNMN 6322	42	52.64	35.43	1.88	34.42	3.91	4.05	13.49	28.68	18.77	4.73	3.18

Table 4. Comparison of the larvae of *Rhacophorus calcaneus* with these of other *Rhacophorus* species occurring in Vietnam (after Hendrix *et al.*, 2007; Wildenhues *et al.*, 2010, 2011; Rowley *et al.*, 2010; Vassilieva *et al.*, 2013, 2016; Grosjean & Inthara, 2016).

	LTRF	tail tip	BL	TL
<i>R. calcaneus</i> (stage 32, n=1)	7(2-7)/3(1)	rounded	16.99	47.37
<i>R. annamensis</i> (stage 41, n=4)	7(3-7)/3	rounded	13.22±0.17	41.22±1.48
<i>R. helenae</i> (stage 37, n=3)	5(2–5)/3	rounded	15.17±0.55	40.63±1.96
<i>R. maximus</i> (stage 35, n=1)	5(2-5)/3(1)	-	13.1	39.3
<i>R. kio</i> (stage 36, n=6)	5(2-5)/3	rounded	20.0±1.42	53.9±3.06
<i>R. orlovi</i> (stage 40, n=1)	4(2-4)/3(1)	rounded	8.3	24.45
<i>R. rhodopus</i> (stage 36, n=8)	6(2-5)/3(1)	-	18.4±0.82	45.7±3.77
<i>R. vampyrus</i> (stage 36, n=1)	upper labium reduced, upper jaw sheath with a few huge, widely spaced hook-shaped serrations, lower jaw sheath absent	pointed	9.9	40.3

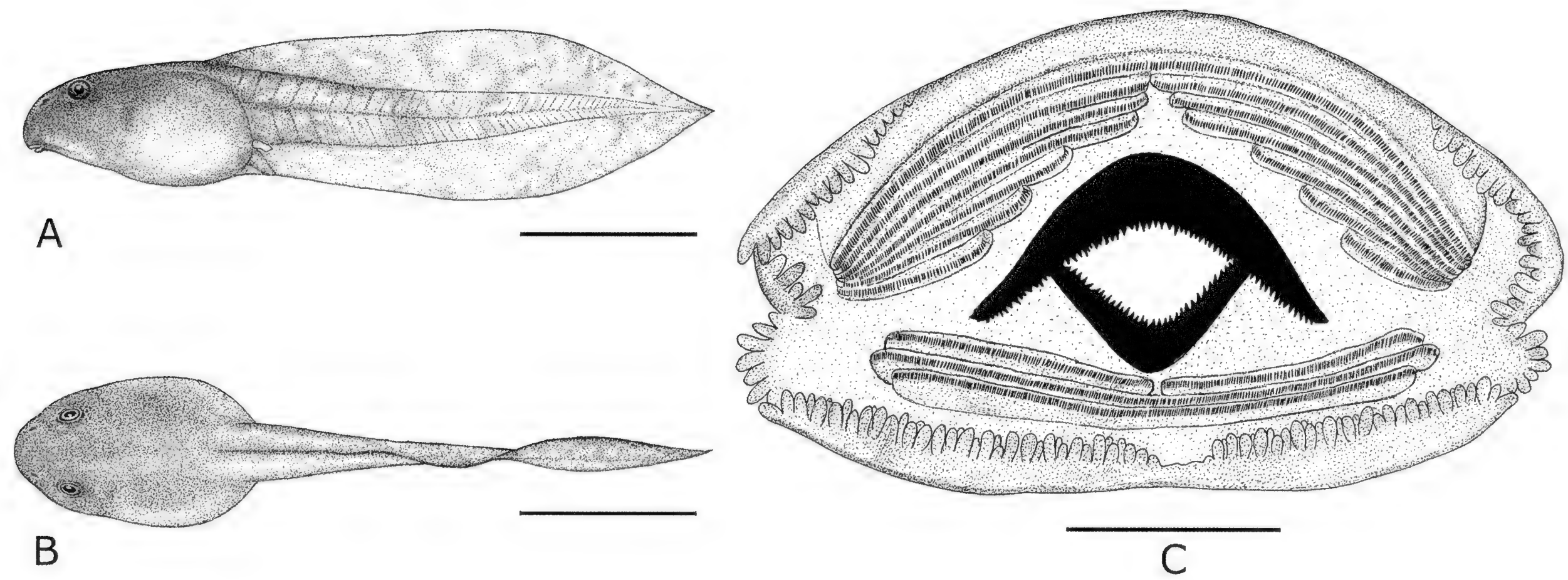


Fig. 2. Drawings of the preserved tadpole (VNMN 6318) of *Rhacophorus calcaneus* from Hon Ba Nature Reserve in Gosner Stage 32: lateral view (A), dorsal view (B) (scale bar = 1 cm); oral apparatus (C) (scale bar = 0.5 mm).

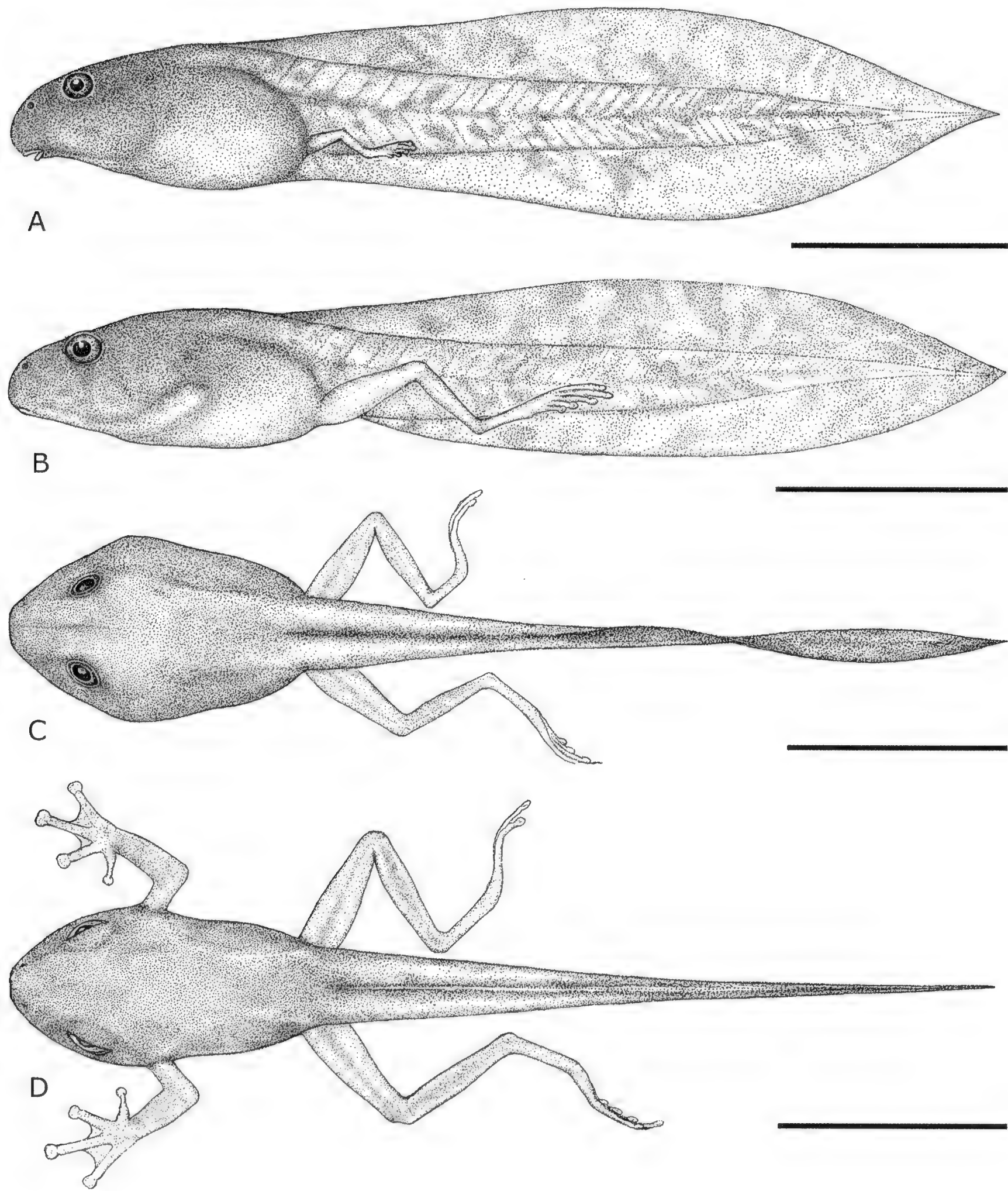


Fig. 3. Drawings of the preserved tadpoles of *Rhacophorus calcaneus* from Hon Ba Nature Reserve in advanced Gosner stages. (A) Stage 36. (B) Stage 37. (C) Stage 41 and (D) Stage 42 (scale bar = 1 cm).

times of body length (BW 11.48 mm; BL 16.86 mm). Keratodont row formula (LTRF): 7(2-7)/3(1). Upper and lower labium with black keratodont rows; keratodonts positioned at margin; lateral keratodont rows absent; keratodont rows with numerous small black keratodonts. The upper labium with seven keratodont rows, A1 positioned at margin, continuous and in curved shape, A2 - A7 divided and separated by upper jaw sheath. The lower labium with three parallel keratodont rows, P1 divided, P2-P3 continuous.

Coloration: Dorsal surface of head and body brown, with several small dark dots; the tail brown, with numerous small dark dots, edge and end of the tail light yellowish brown. Ventral surface whitish; vent tube region opaque-white; abdominal fins slightly lighter than tail; limbs white.

In general, the collected tadpoles of *R. calcaneus* in Gosner stages 32-37 can be diagnosed as follows: medium-sized; oral disk anteroventrally positioned; LTRF: 7(2-7)/3(1); upper jaw sheath semicircular and narrow; spiracle sinistral, single, ventrolaterally positioned at midbody; vent tube open, round, dextral and located directly at end of body between limbs; tail tip round; body and tail brown with numerous small dark dots.

ACKNOWLEDGEMENTS

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***Urodepressa guatemalaensis* gen. nov, sp. nov., a new remarkable genus and species from Guatemala (Acari: Uropodina: Urodinychidae)**

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Abstract: A new, monotypic genus (*Urodepressa* gen. nov.) is described from females and males of *Urodepressa guatemalaensis* sp. nov. collected in Guatemala. The new genus belongs to the family Urodinychidae Berlese, 1917 due to the shape of its gnathosomal appendages, but differs from the other previously described genera in this family by the presence of a large dorsal depression, by the shape of its dorsal and ventral setae and by the unusual hook-like anterior process on the female genital shield.

Keywords: Taxonomy - new taxa - Central-America.

INTRODUCTION

The Uropodina mites constitute a characteristic and important component of the soil mesofauna all around the world. The highest diversity of this group can be found in the tropical regions, especially in the Neotropics where numerous endemic genera (like *Baloghjkaszabia* Hirschmann, 1973; *Kaszabjbaloghia* Hirschmann, 1973; *Tetrasejaspis* Sellnick, 1941; *Clausiadinychus* Sellnick, 1930; etc.) were discovered (Wiśniewski, 1993).

Regarding the number of species of Uropodina mites known from the different Neotropical countries (Wiśniewski, 1993), Guatemala is one of the poorly studied countries of the region with less than 20 species reported up to now (Wiśniewski, 1993).

In the present paper I would like to add more information about the Uropodina of the Neotropical region and the description of a new genus collected in Guatemala.

MATERIAL AND METHODS

The specimens examined were cleared in lactic acid and the drawings were made with the aid of a drawing tube mounted on a Leica 1000 compound microscope. All specimens are stored in ethanol and deposited in the Natural History Museum of Geneva. Abbreviations: h = hypostomal setae, St = sternal setae, p = pores, lf = lyriform fissures. All measurements and the scales in the figures are given in micrometres (µm).

TAXONOMY

***Urodepressa* gen. nov.**

Diagnosis: Idiosoma subpentagonal, with anterior vertex and humeral projections. Posterior margin with deep and concave incision. Marginal and dorsal shields completely separated. Dorsal shield with a large rectangular depression, anterior part of depression shallow, posterior part deep. All dorsal setae wide, phylliform or lanceolate and marginally serrate, setae j1 longer and more robust than other ones. Eight pairs of very long and marginally serrate setae situated on dorsal and marginal shields and arranged in three groups. Prestigmatic part of peritreme narrow and V-shaped. Genital shield of female with a hook-like anterior process. Sternal setae small, smooth and needle-like. Hypostomal setae h2 robust, h1 long, smooth and needle-like, h2, h3 and h4 with lateral spines. Chelicerae with internal sclerotized node. Tarsi of leg I without claws.

Type species: *Urodepressa guatemalaensis* sp. nov.

Etymology: The name of the new genus refers to the large depression on the dorsal idiosoma. The gender of the new genus name is feminine.

Notes: On the basis of the apically pilose internal malae, the smooth and needle-like setae h1, the robust setae h2, the presence of an internal sclerotized node on the chelicerae and the absence of tarsal claws on leg I, I place the new genus into the family Urodinychidae

Berlese, 1917. The concept of the family Urodinychidae follows by Mařán (2001), Beaulieu *et al.* (2011) and Kontschán (2013). According to these papers, the Urodinychidae differ from the Dinychidae Berlese, 1916 by the presence of leg grooves which are not developed in the Dinychidae (Kontschán, 2013). The new genus differs from the other previously described genera in this family by the presence of a large dorsal depression, by the shape of dorsal and ventral setae and by the unusual hook-like anterior process on the female genital shield.

Urodepressa guatemalaensis sp. nov.

Figs 1-16

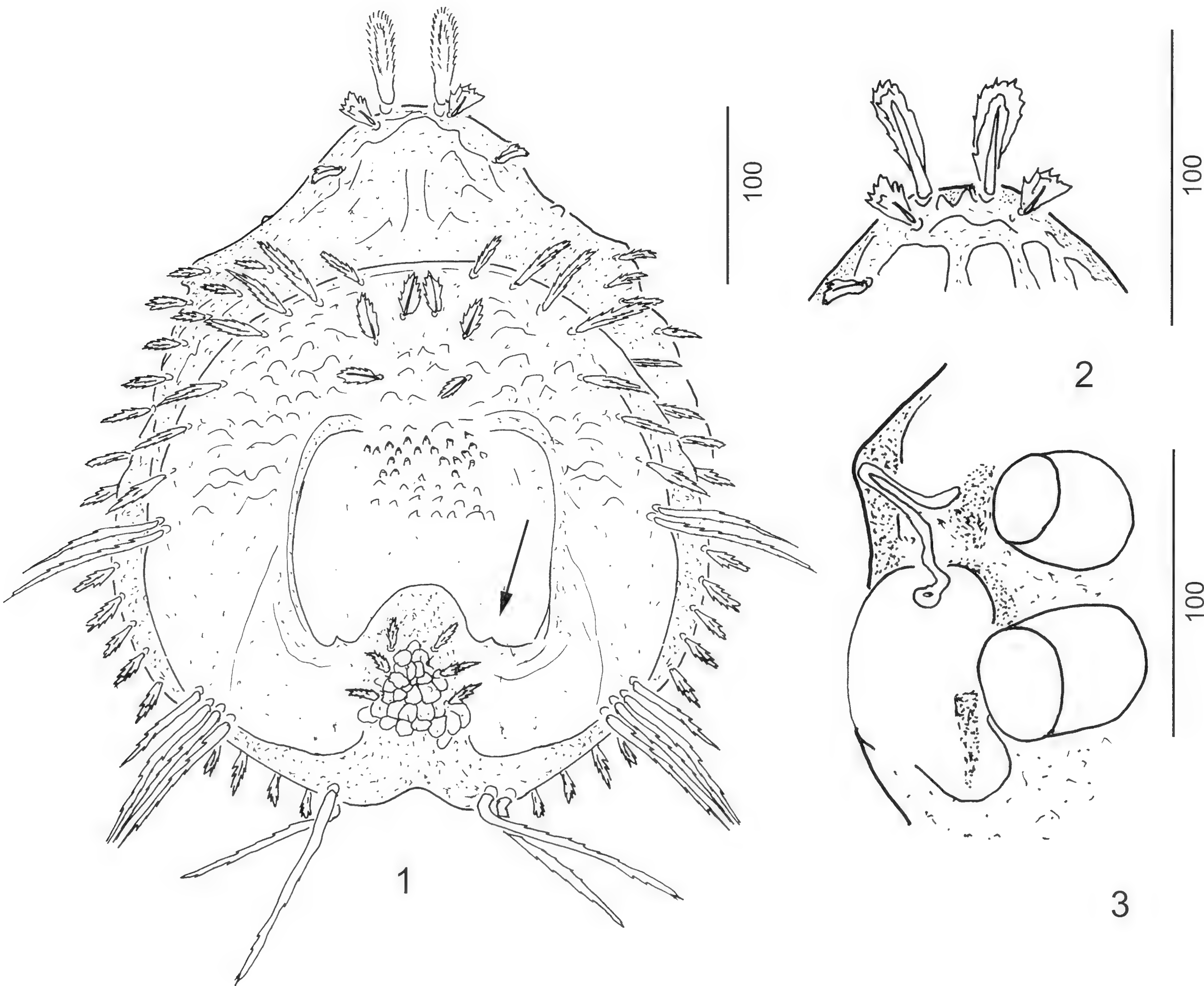
Holotype: MHNG; female; Guatemala, Tikal (app. Winkler); 28-29 December 1975; leg. A. de Chambrier.

Paratypes: MHNG; two females and seven males with same data as for holotype.

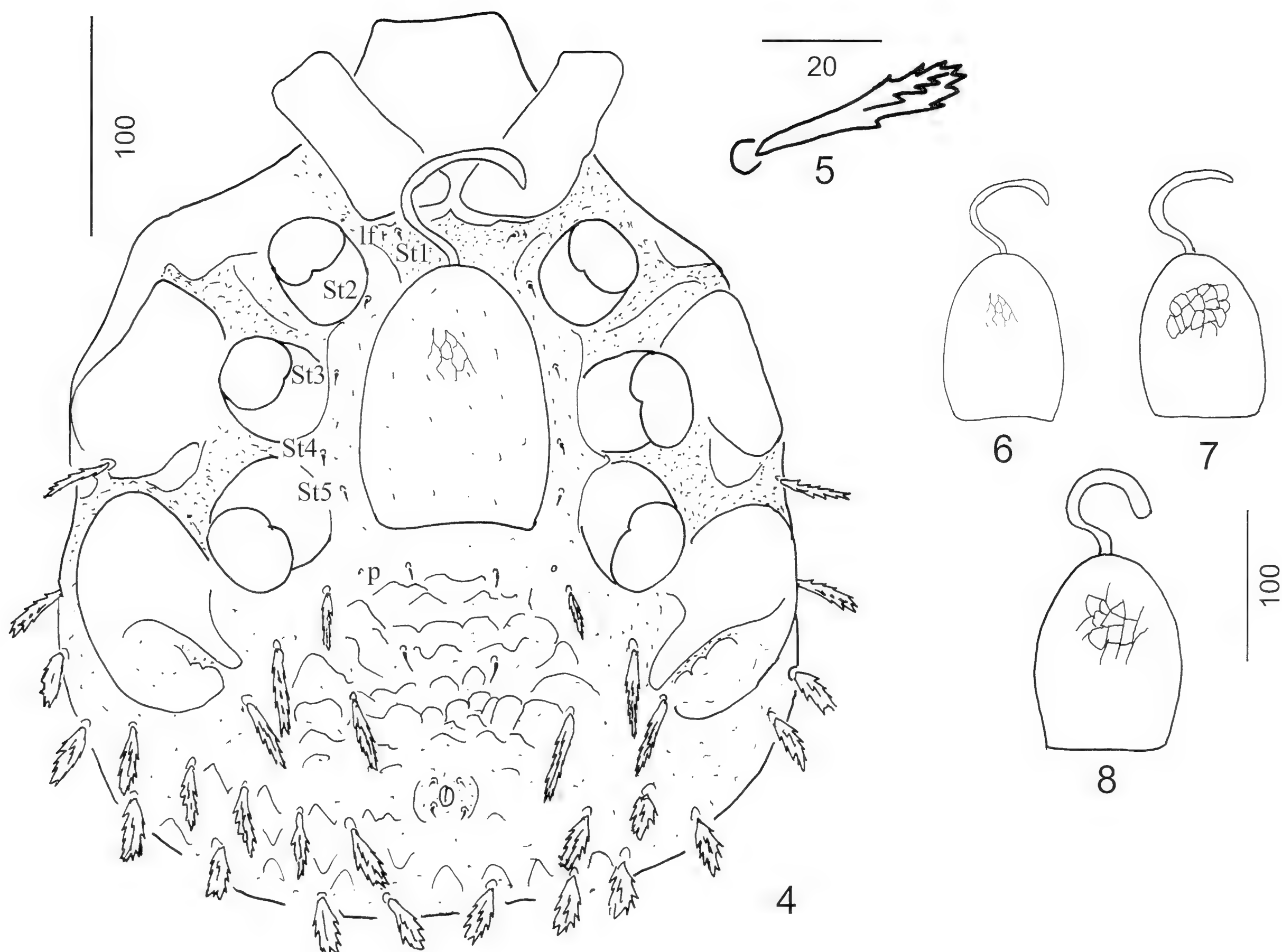
Diagnosis: See diagnosis of genus.

Description of females: Length of idiosoma 370-410, width 340-350 (n=3). Idiosoma subpentagonal, with anterior vertex and humeral projections. Posterior margin with deep and concave incision. Color yellowish brown.

Dorsal side of idiosoma (Fig. 1): Seven pairs of short (about 22-42), phylliform and marginally serrate setae placed on anterior margin dorsal shield. Eight pairs of longer (about 60-120), narrow and marginally serrate setae in groups (2-4-2) situated on lateral, caudal-lateral margins of dorsal shield and caudal part of marginal shield. A large, rectangular depression (about 110-120×130-145) situated in central area of dorsal shield. Anterior part of dorsal depression shallow, with small oval pits on its surface; posterior part deeper, with posterior margin reversely U-shaped. Medial posteriormost surface with flat elevation bearing two small triangular structures. Dorsal surface of elevated region bearing three pairs of short (about 18-25), phylliform marginal



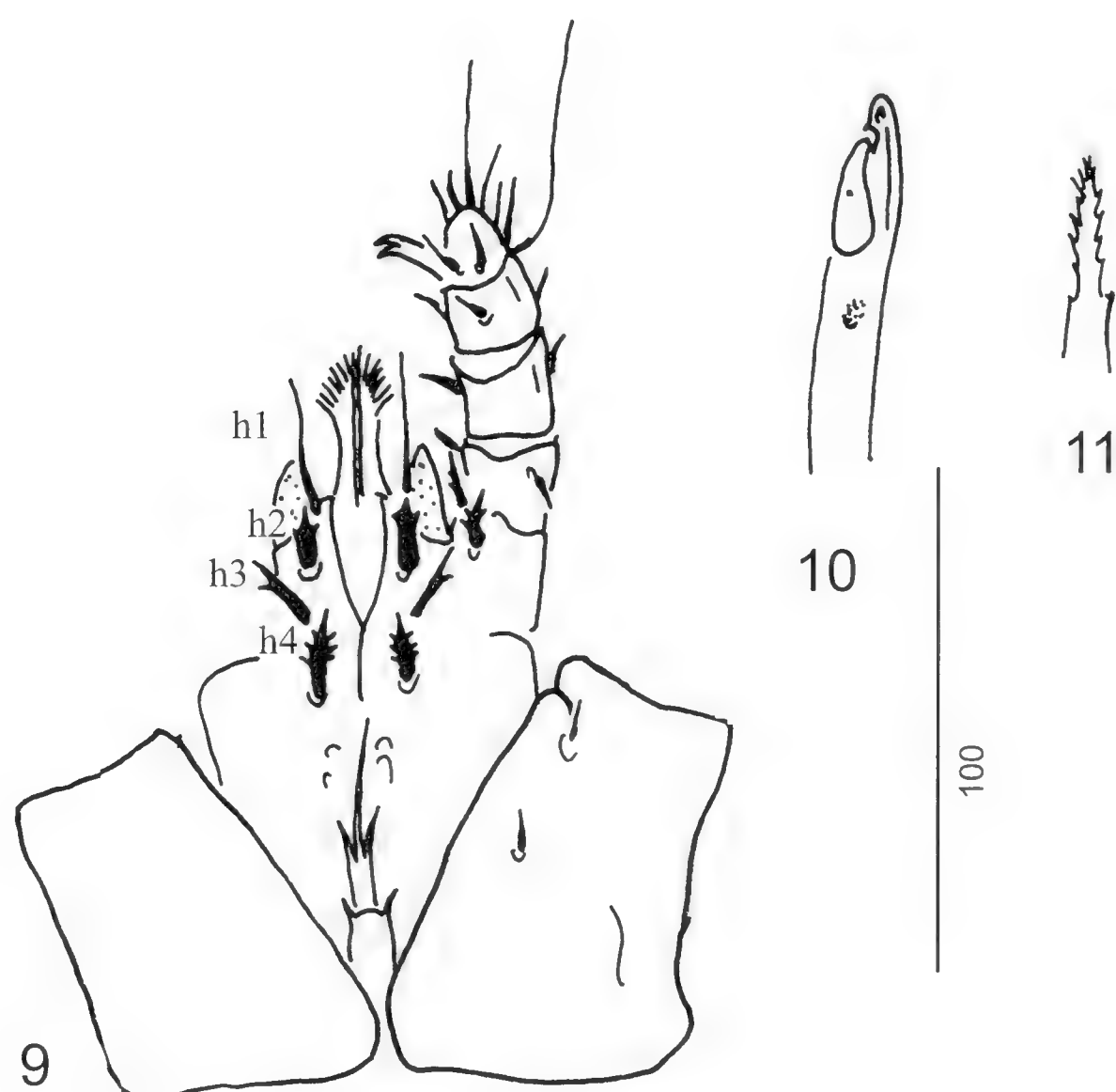
Figs 1-3. *Urodepressa guatemalaensis* gen. nov., sp. nov., female holotype. (1) Body in dorsal view (arrow indicates a triangular appendage). (2) Apical part of dorsal idiosoma. (3) Peritreme.



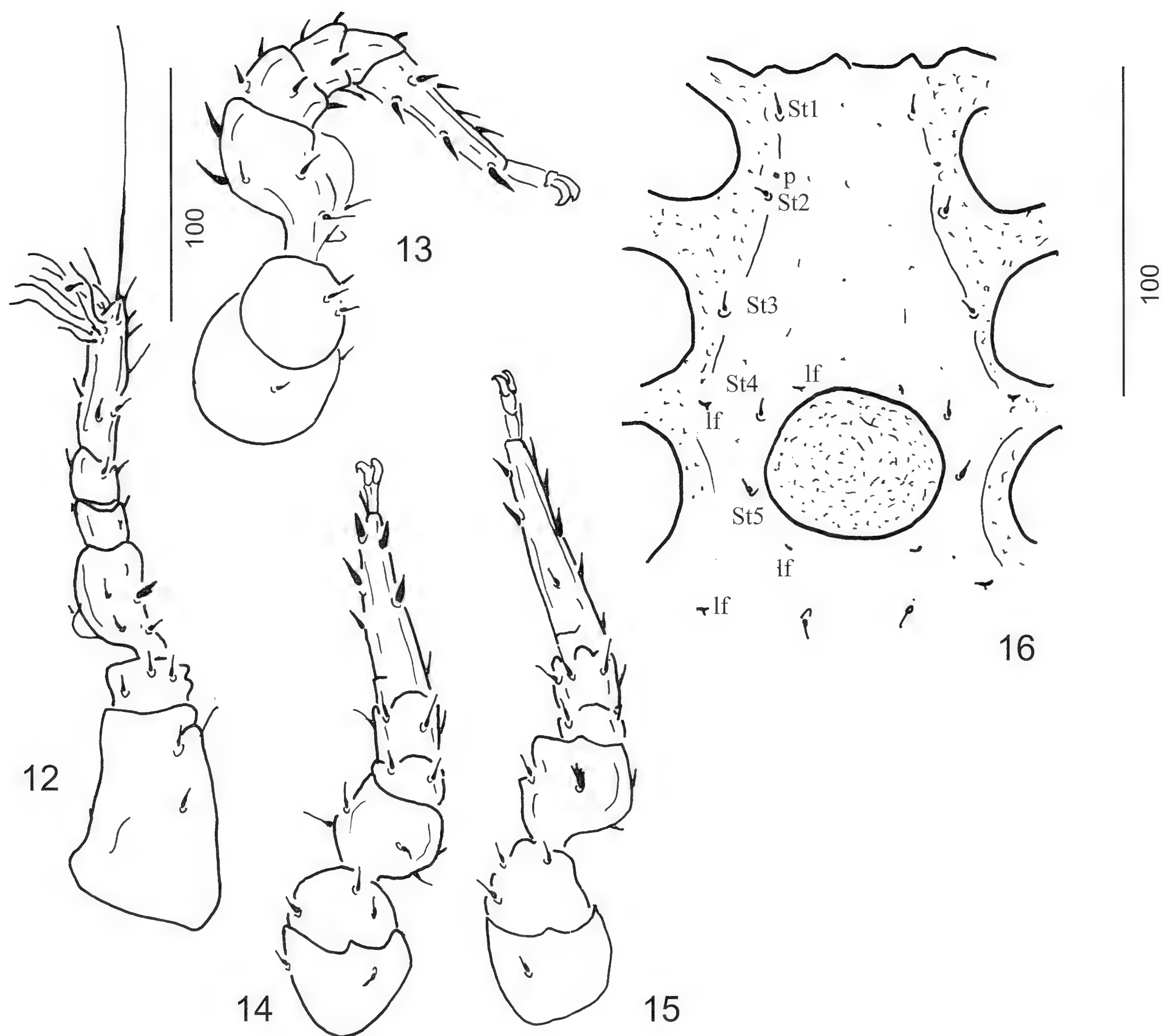
Figs 4-8. *Urodepressa guatemalaensis* gen. nov., sp. nov., female holotype (4-6) and female paratypes (7-8). (4) Body in ventral view. (5) Ventral seta. (6-8) Genital shields.

setae and covered by web-like sculptural pattern. Surface of anterior area of dorsal shield covered by reticulate sculptural pattern. Marginal shield with numerous (20-21) short (about 30-40), phylliform marginal setae, its surface covered by reticulate sculptural pattern, setae j1 longer and wider (about 55-60) than other setae on marginal shield (Fig. 2).

Ventral side of idiosoma (Fig. 4): Base of tritosternum narrow, with two anterolateral spines; tritosternal laciniae three-tined, tines smooth and pointed, central tine moderately elongate (Fig. 9). Sternal shield without sculptural pattern. All sternal setae short (about 6-8), smooth and needle-like. Sternal setae St1 situated close to anterior margin of sternal shield, St2 at level of central area of coxae II, St3 at level of anterior margin of coxae III, St4 at level of anterior margin of coxae IV and St5 at level of central area of coxae IV. One pair of lyriform fissures situated close to St1, one pair of pores placed close to first pair of needle-like ventral setae. Two pairs of ventral setae posterior to genital shield minute (about 7-10), smooth and needle-like, other ventral setae longer (about 25-35), slightly broadened medially, phylliform,



Figs 9-11. *Urodepressa guatemalaensis* gen. nov., sp. nov., female holotype. (9) Ventral view of coxae I, gnathosoma, tritosternum and palp. (10) Lateral view of chelicera. (11) Epistome.



Figs 12-16. *Urodepressa guatemalaensis* gen. nov., sp. nov., female holotype (12-15) and male paratype (16). (12) Leg I. (13) Leg II. (14) Leg III. (15) Leg IV (all legs in ventral view). (16) Intercoxal area.

with marginal serration (Fig. 5). Surface of ventral shield covered by reticulate sculptural pattern. Anal opening small (about $9-10 \times 6-7$), two pairs of adanal setae minute (about $4-6$), smooth and needle-like. Postanal seta absent. Genital shield large (about $110-120 \times 80-85$), scutiform, with reticulate surface and with a large, hook-like anterior process (Figs 6-8). Stigmata situated between coxae II and III. Prestigmatic part of peritremes V-shaped, poststigmatic part absent (Fig. 3). Pedofossae relatively deep, their surface smooth.

Gnathosoma (Fig. 9): Corniculi horn-like, internal malae twice as long as corniculi and apically pilose. Hypostomal setae h1 longer (about $26-28$ in length), smooth and needle-like; h2 shorter (about $14-16$), robust and laterally with one pair of subapical spines; h3 narrower (about $16-18$ in length), with unpaired subapical spine; h4 robust (about $17-20$ in length), with distal lateral margins well

spinose. Palp trochanter bearing two ventral seta with serrate margins. Other setae on palp smooth and needle-like. Epistome lanceolate, densely serrate on lateral margins (Fig. 11). Chelicerae with one tooth on fixed digit, fixed digit longer than movable digit, one pit-like sensory organ situated in central part of movable digit and one on apical part of fixed digit. Internal sclerotized node present (Fig. 10).

Legs (Figs 12-15): Leg I $240-250$ long, leg II $270-280$, leg III $240-255$, leg IV $230-240$. Legs I without claws. Most setae on legs needle-like, a few spine-like and serrate setae present on all legs.

Description of males: Length of idiosoma $410-430$, width $340-370$ ($n=6$). Shape same as in females.

Dorsal side of idiosoma: Ornamentation and chaetotaxy of dorsal shield as in female.

Ventral side of idiosoma: Ornamentation and chaetotaxy of ventral shield as in female. Sternal shield without sculptural pattern (Fig. 16). Sternal setae smooth and needle-like (about 5-7 long), St1 situated close to anterior margins of sternal shield, St2 at level of posterior margin of coxae II, St3 at level of central area of coxae III, St4 and St5 situated lateral to genital shield. One pair of pores situated between St2 and St3, two pairs of lyriform fissures close to St4 and two other pairs close to first needle-like ventral setae. Genital shield rounded, slightly wider than long (about 45-48×50-55 in dimension) and situated between coxae IV. Other characters as in female. Larva and nymphs unknown.

Etymology: The name of the new species refers to the country where the type specimens were collected.

DISCUSSION

Large cavities on the body are not an unknown feature within the suborder Uropodina. Large cavities can be seen in the caudal part of the dorsal idiosoma of the genera *Hutufeideria* (Kontschán, 2011) and *Jedediella* (see Kontschán, 2016 and Kontschán & Starý, 2012), and in some cases this is visible on the ventral side of the body in some genera (like: *Depressorotunda* Kontschán, 2010 and *Didepressorotunda* Kontschán, 2010) of the family Rotundabaloghiidae Kontschán, 2010. Currently we do not have any information about the function of these large depressions on the body of these mites. Soil and other particles have never been observed in these cavity-like depressions, therefore they may not play any role in camouflage. They may play a role in chemical communication or during mating.

The anterior process on the female genital shield is a rarely observed character in Uropodina mites. Usually it is a small, spine-like projection in some species of *Uroobovella* Berlese, 1903 or a long and spear-like process in members of the genus *Nenteria* Oudemans, 1915 (Mašán, 2001). Extreme forms of this character are very rarely found: two anterior projections of the genital shield were described in the genera *Capricornella* Błoszyk *et al.*, 2017 and *Crinitodiscus* Sellnick, 1931 (Błoszyk *et al.*, 2017; Kontschán, 2015), but till today a hook-shaped anterior process on the female genital shield was never observed.

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Notes on *Smetanabatrus* from Southeast Asia (Coleoptera: Staphylinidae: Pselaphinae)

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Abstract: A new species of *Smetanabatrus* Yin & Li, *S. loebli* Yin & Cuccodoro sp. nov., is described and illustrated from West Malaysia, representing the third known member of the genus. Additionally, *Smetanabatrus ghecu* Yin & Li, originally described from Myanmar, is recorded from a new locality in Thailand. A key to and a distributional map of the three *Smetanabatrus* species are provided.

Keywords: Batrisini - taxonomy - new taxon - new collecting data - Indomalayan region.

INTRODUCTION

The oriental pselaphine genus *Smetanabatrus* Yin & Li (Batrisitae: Batrisini) has until now included only two species in Southeast Asia: *S. kinabalu* Yin & Li (type species) from Borneo, and *S. ghecu* Yin & Li from central Myanmar (Yin & Li, 2013, 2015). Males of this genus, as far as is known, possess a sexually modified visible sternite 3 (morphologically sternite V) which bears a prominent median projection. Other male dimorphic characters can often be found on the head, various parts of the legs, and tergites. A few notable features, *i.e.*, the presence of ocular canthi, strongly broadened/lobed fourth maxillary palpomeres, and a markedly large and transverse aedeagal basal capsule, are shared by both known species. These characters may provide a reliable means to separate *Smetanabatrus* from related batrisine genera.

When sorting unidentified pselaphine material housed in the Muséum d'histoire naturelle de Genève, we recognized three more *Smetanabatrus* specimens. The finding included a new species from West Malaysia, and a new country record for *S. ghecu* in Thailand.

MATERIAL AND METHODS

The material treated here is deposited in the Muséum d'histoire naturelle de Genève, Switzerland (MHNG). The label data of the material are quoted verbatim. Dissected parts are preserved in Euparal on plastic slides that are placed on the same pin with the specimen. The

habitus images (Fig. 1A) were taken using a Canon 5D Mark III camera in conjunction with a Canon MP-E 65mm f/2.8 1-5X Macro Lens, and a Canon MT-24EX Macro Twin Lite Flash was used as light source. Images of other morphological details (Fig. 1B-I) were produced using a Leica DFC425 Camera attached to a Leica M205C stereomicroscope, using reflected light. Zerene Stacker (version 1.04) was used for image stacking. All images were modified and grouped into plates in Adobe Photoshop CS5 Extended. The base map was obtained from <http://www.simplemappr.net>, an on-line tool for creating maps that can be freely used for publications and presentations (Shorthouse, 2010).

Following Chandler (2001), the abdominal tergites and sternites are numbered in Arabic for the visible segments, and in Roman to indicate their morphological position. The visible abdominal segments begin with tergite 1 (IV) and sternite 1 (III).

TAXONOMY

Smetanabatrus loebli sp. nov.

Figs 1-2

Type locality: Genting Highlands, Pahang, Peninsular Malaysia.

Type material (2 ex.): Holotype, MHNG-ENTO-00013301; ♂; W. Malaysia # 28, Pahang, Genting Highlands, Awana, 950 m; 4.iv.93; coll. Löbl; veg. debris; “HOLOTYPE (red, printed), *Smetanabatrus loebli* Yin & Cuccodoro 2018”. – Paratype:

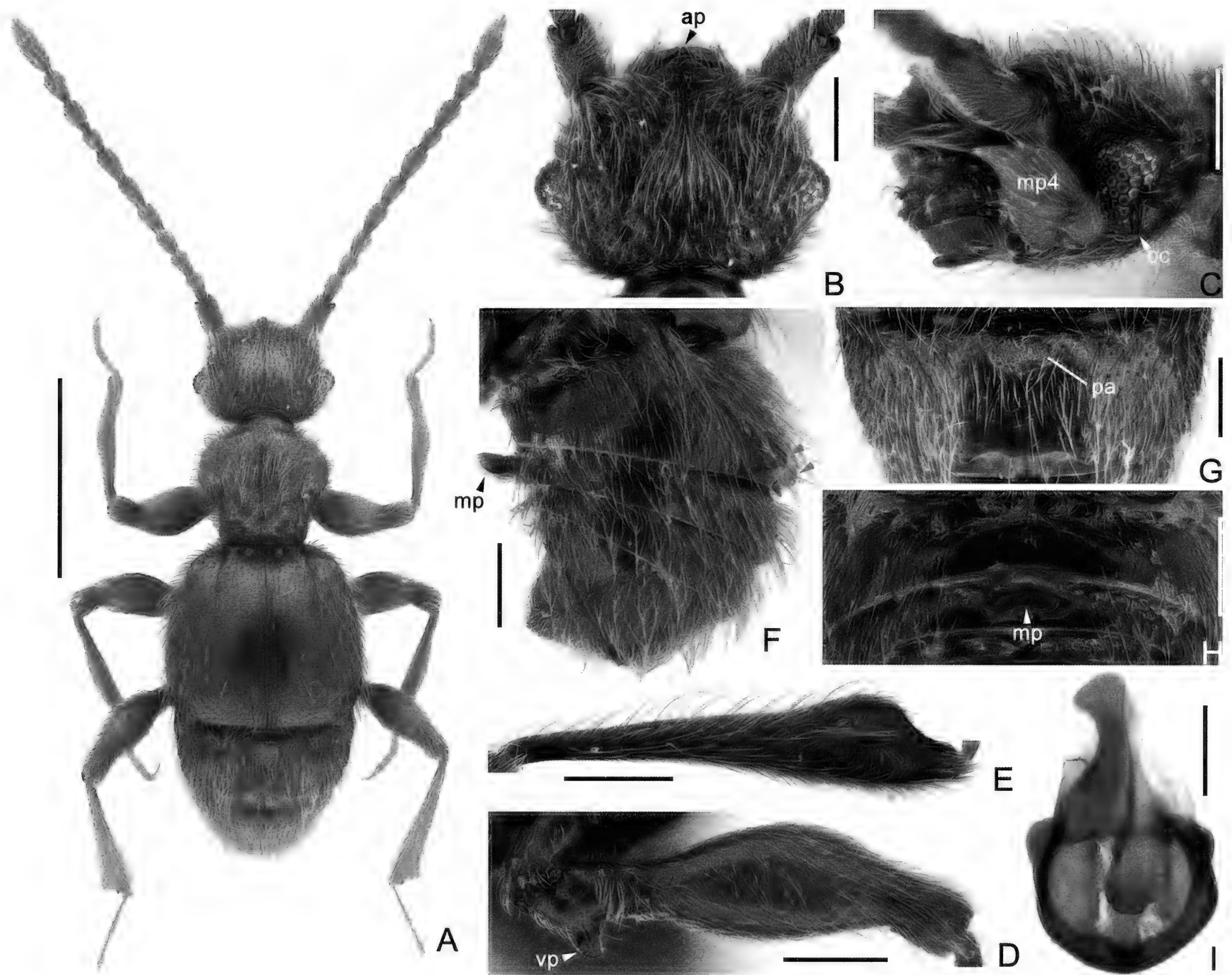


Fig. 1. *Smetanabatrus loebli* male. (A) Dorsal habitus. (B) Head dorsum. (C) Anterolateral view of head, showing form of maxillary palpomere IV and ocular canthus. (D) Protrochanter and profemur. (E) Metatibia. (F) Lateral view of abdomen, showing projections on tergite 1 (IV) and sternite 3 (V). (G) Tergite 1. (H) Median projection of sternite 3, in ventral view. (I) Aedeagus, in ventral view. Scale bars: 1 mm in A; 0.2 mm in B-H, 0.1 mm in I. Abbreviations: ap – apical protuberance, mp – median projection, mp4 – maxillary palpomere IV, oc – ocular canthus, pa – patch, vp – ventral projection.

MHNG-ENTO-00013318; ♀; Malaysia, Malaya, Fraser's Hill, 1500 m; 11.iii.(19)90; coll. Rougemont; "PARATYPE (yellow, printed), *Smetanabatrus loebli* Yin & Cuccodoro 2018".

Diagnosis: Body medium-sized, length 2.66–2.79 mm. Head and pronotum regularly punctate, anterior margin of clypeus angularly projecting anteriorly at middle. Pronotum with thin discal carinae, with distinct median and lateral sulci. Maxillary palpomere IV greatly lobed at inner margin. Distinct ocular canthus present. Males have abdominal tergite 1 (IV), and sternite 3 (V) modified; protrochanter protuberant at ventral margin, metatibia strongly dilated at apical portion; aedeagus with large and transverse basal capsule, median lobe slightly asymmetric.

Description: Male (Fig. 1A). Body length (combined length of head, pronotum, elytra, and abdomen) 2.66 mm. Body reddish brown, tarsi and mouthparts lighter in color. Head distinctly transverse, length from clypeal anterior margin to head base 0.55 mm, width across eyes 0.71 mm; surface regularly punctate; vertex convex, foveae far below level of posterior margins of eyes, lacking reverse U-shaped sulcus connecting foveae, thin median carina present from base toward apex of frons, anterior margin of clypeus angularly protuberant (Fig. 1B; ap) at middle; eyes moderately prominent, longitudinal length 0.15 mm, each eye composed of about 45 facets; with short ocular canthus (Fig. 1C; oc); maxillary palpus with palpomere IV greatly lobed on inner margin (Fig. 1C; mp4); length of antenna 1.85 mm; antennomeres each elongate,

club indistinct (Fig. 1A). Pronotum nearly cordiform, about as long as wide, length along midline 0.60 mm, maximum width 0.64 mm, regularly punctate; with triangular antebasal spines, deep median and thinner lateral sulci, and slightly curved discal carinae on disc; lateral margins rounded on apical half, straight and nearly parallel from middle toward base. Elytra slightly wider than long, length along suture 0.88 mm, maximum width 1.00 mm; surface finely punctate; with three large, deep basal foveae, thin and shallow discal sulcus extending just past half elytral length. Legs moderately elongate; protrochanter with large flatten projection (Fig. 1D; *vp*) on ventral margin, protibia (Fig. 1A) with lateral margin slightly expanded near middle; metatibia (Fig. 1E) greatly dilated laterally on apical third, expansion broadly concaved on ventral surface. Abdomen much wider than long, length of dorsally visible part along midline 0.63 mm, maximum width 0.90 mm; tergite 1 (IV) longest, at basal half with transverse oval patch (Fig. 1G; *pa*) slightly raised, maximum diameter of patch 0.14 mm, area lateral to midline moderately raised (Fig. 1F; indicated by red arrows); tergites 2-4 (V-VII) unmodified, with tergite 4 longer than tergites 2 and 3; sternite 3 (V) with reniform (in ventral view) median protuberance (Fig. 1F, 1H; *mp*) strongly projecting ventrally. Aedeagus (Fig. 1I) slightly asymmetric, length 0.33 mm; basal bulb transverse, with large foramen; ventral lobe elongate, broad at base, narrowing at middle, and then roundly expanded toward apex.

Female. Similar to male in external morphology, except having unmodified legs and abdominal segments, slightly shorter antennae, and smaller eyes each composed of about 25 facets. Measurements (as for male): Body length 2.79 mm; head length 0.55 mm, width 0.68 mm; length of eye 0.14 mm; length of antenna 1.59 mm; length of pronotum 0.59 mm, width 0.66 mm; length of elytra 0.80 mm, width 0.95 mm; length of abdomen 0.85 mm, width 0.89 mm.

Comments: Several shared features, *i.e.*, the slightly expanded outer margin of the protibia, modified male tergite 1 (IV), and strongly dilated male metatibia suggest that the new species may be more closely related to *S. kinabalu* from Borneo than to *S. ghecu* from Myanmar. Males of the latter species have the protibia slightly broadened on inner margin, and have unmodified tergite 1 (IV) and metatibia. Separation of the males of these three species may be accomplished by using the key presented below.

Biology: According to unpublished MHNG field notes, #28 on the label of the holotype indicates that the individual was sifted from an accumulation of branches and bamboo leaves in a rather dry forest

Distribution: West Malaysia (Pahang; Fig. 2).

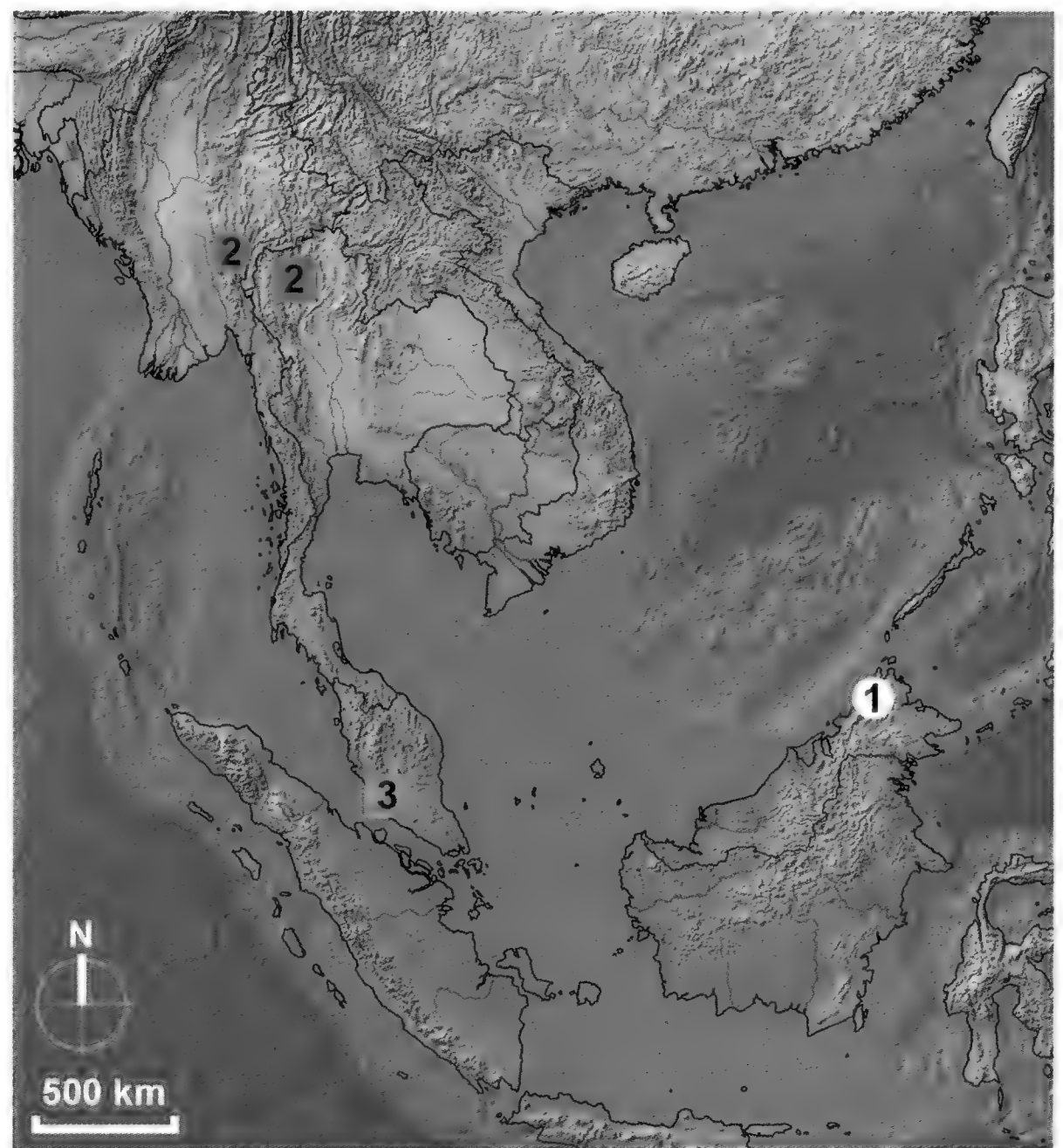


Fig. 2. Distribution of *Smetanabatrus* species. 1 – *S. kinabalu*, 2 – *S. ghecu*, 3 – *S. loebli* sp. nov. Circles are published records, squares represent new data.

Etymology: The new species is named after Ivan Löbl (Geneva, Switzerland), who collected the single male.

Smetanabatrus ghecu Yin & Li, 2015

Smetanabatrus ghecu Yin & Li, 2015: 377.

Type locality: Carin Ascuii Ghecù, southern Shan State, central Myanmar.

Material examined: MHNG-ENTO-00013302; ♀; Thailand, Chiang Mai, Doi Suthep; 3. 87; coll. de Rougemont; “*Smetanabatrus ghecu* Yin & Li 2015, Det. Yin 2018”.

Distribution: Myanmar (southern Shan State); Thailand (Chiang Mai), **new country record** (Fig. 2).

Comments: Given the similar body size (3.38 mm) and proportions, roundly broadened inner and outer margins of the maxillary palpomere IV, presence of a reversed ‘U’-shaped sulcus on the vertex, and coarsely punctate head and pronotum, the present specimen can be readily identified as conspecific with the population from central Myanmar. The present record expands the distributional range of this species some 220 km to the southeast from the type locality.

Key to males

- 1
- Vertex lacking reversed ‘U’-shaped sulcus connecting foveae (Fig. 1B); maxillary palpomere IV distinctly lobed on inner margin (Fig. 1C; Yin & Li, 2013: fig. 2A); protibia slightly broadened on outer margin (Fig. 1A; Yin & Li, 2013: fig. 1A), metatibia strongly dilated laterally on apical portion (Fig. 1A, 1E; Yin & Li, 2013: figs 1A, 2C) ...
.....2
-
- Vertex with distinct reversed ‘U’-shaped sulcus connecting foveae (Yin & Li, 2015: fig. 1); maxillary palpomere IV with both outer and inner margins roundly expanded (Yin & Li, 2015: fig. 2E); protibia slightly expanded on inner margin (Yin & Li, 2015: figs 1A, 2D), metatibia unmodified. Distribution: Myanmar, Thailand (Fig. 2).....
.....*S. ghecu*
- 2
- Protrochanter simple, profemur with large ventral spine (Yin & Li, 2013: fig. 2B); tergite 1 (IV) with large lateral expansions and broad, deep median cavity, tergites 2-3 (V-VI) strongly raised at middle (Yin & Li, 2013: figs 1A, 2D-E). Distribution: East Malaysia (Fig. 2)*S. kinabalu*
-
- Protrochanter with large, flat protuberance on ventral margin, profemur simple (Fig. 1D); tergite 1 (IV) with median patch at basal half, submedial area moderately raised, tergites 2-3 (V-VI) unmodified (Fig. 1F-G). Distribution: West Malaysia (Fig. 2)..... *S. loebli* sp. nov.

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An annotated list of the type specimens of Megaloptera, Neuroptera and Raphidioptera in the collection of the Muséum d'histoire naturelle de Genève

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Abstract: The Muséum d'histoire naturelle de Genève contains type specimens of fifty one species of neuropteroid insects; two species of Megaloptera, forty six species of Neuroptera and three species of Raphidioptera. These are listed, the label data and condition of the specimens is presented and the current nomenclatural combination is given.

Keywords: Lacewing - antlion - snakefly - alderfly - Geneva - type catalogue.

INTRODUCTION

The collection of neuropteroid insects held by the Muséum d'histoire naturelle de Genève (MHNG) is founded on the specimens collected and studied by François-Jules Pictet de la Rive (1809-1872), a pioneer in the study of several insect groups then classified with the Neuroptera (Hollier & Hollier, 2014) and the “godfather” of the MHNG (Sigrist, 1995). Ironically, Pictet did not finish his planned work on the Neuroptera *sensu stricto* and it remains unpublished, although he described some fossil species from Baltic amber (Pictet-Baraban [sic] & Hagen, 1856).

One of Pictet's sons, Albert-Edouard Pictet-Mallet (1835-1879), continued his father's study of the Neuroptera and inherited his father's personal collection. Edouard (as he was known) was more a man of action than a savant, and although he published the results of his expedition to Spain with Rudolf Meyer-Dür (1812-1885) in 1859 (Pictet, 1865), his other work remained unfinished and unpublished (Saussure, 1879). Their joint collection was donated to the MHNG by Edouard's son Camille Pictet (1864-1893) in 1887 and the specimens were given standard MHNG labels with the acquisition code 620-48: some of the specimens thus labelled should have been in the MHNG collection already, and it is generally impossible to identify the specimens that belonged to the elder Pictet (Hollier, 2007). Some of Pictet's specimens were given to Hermann August Hagen (1817-1893) to study and are now deposited in the Museum für Naturkunde in Berlin (see Zwick, 1971) or in the Museum of Comparative Zoology of Harvard

University where Hagen ended his career as Professor of Entomology (see Aspöck & Aspöck, 1994).

The MHNG collection was enriched by specimens brought back from the expeditions of Henri de Saussure to Mexico and the Antilles in 1854-1856 and of Aloïs Humbert to Sri Lanka (then Ceylon) in 1858-1860. Further specimens were acquired by occasional exchanges, purchases and gifts, but most of the collection dates from the 19th century. A number of experts such as Robert McLachlan (1837-1904), Longinos Navás (1858-1931) and Peter Esben-Petersen (1869-1942) have left traces in the collection. More recently, Claude Poivre both studied specimens from the collection and donated others, and Bo Tjeder (1901-1992), Herbert Hölzel (1925-2008), Mervyn Mansell and Ulrike and Horst Aspöck have studied specimens in the collection.

ARRANGEMENT AND FORMAT

The species are listed alphabetically. The format for each is:

specific epithet Author, publication: page [*Original generic placement*].

Provenance as given in the original description, depository. Type series.

Number of specimens in the MHNG. Label data of specimen. Following the recommendation of Ohl & Oswald (2004) the condition of each specimen is noted. Other comments.

Currently valid combination

The nomenclature used in this paper follows Oswald (2018).

The following abbreviations are used in the list:

BMNH Natural History Museum, London

ISNB Institut Royal des Sciences Naturelles de Belgique, Bruxelles

MCBS Museu de ciències naturals, Barcelona

MCZC Museum of Comparative Zoology, Harvard University, Cambridge

MHNG Muséum d'histoire naturelle de Genève

MNHN Muséum national d'Histoire naturelle, Paris

NHMB Naturhistorisches Museum, Basel

NHMW Naturhistorisches Museum, Wein

RMHN Naturalis Biodiversity Center, Leiden

TMSA Transvaal Museum, Pretoria

CATALOGUE

MEGALOPTERA

latratus tonkinensis Weele, 1907a: 239-241, pl. 3, fig. 2 [*Neuromus*].

Tonkin, Leidener- und Genfer Museum. More than one specimen (only ♂ mentioned explicitly).

Two ♂ syntypes. A ♂ specimen with labels: “Tonkin, Mauson Montes, April.Mai, 2-3000”, H. Fruhstorfer” [printed on white card]; “331” [handwritten on a square of white paper]; “*Neuromus latratus*, ML. subspecies *tonkinensis* v. d. W., type” [handwritten on white card]; “Syntypus” [printed on red paper]. Specimen set with wings folded.

A ♂ specimen with labels: “Tonkin, Mauson Montes, April.Mai, 2-3000”, H. Fruhstorfer” [printed on white card]; “332” [handwritten on a square of white paper]; “*Neuromus latratus tonkinensis* Weele, type” [handwritten on white card with a printed border]; “Syntypus” [printed on red paper]. Specimen set with wings folded; the tip of the right antenna is missing. There are presumably other syntypes in the RMNH.

Neoneuromus tonkinensis (Weele, 1907)

nigripes Pictet, 1865: 52, pl. 4, figs 1-5 [*Sialis*].

San Ildefonso. Unspecified number of ♂ and ♀.

♂ lectotype, designated by Monserrat (2011: 159) and seven possible paralectotypes. A ♂ specimen with labels: “620 48 Granjas, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Granjas, Juillet 1859” [printed on white card]; “2” [handwritten on a square of white paper]; “*Sialis nigripes* Pict.” [handwritten on white paper]; “*S. nigripes* Pict” [handwritten on white paper]; “Lectotype designated by V. Monserrat, 2011” [handwritten on white paper]; “Lectotypus” [printed on red card]. Specimen set with wings roughly spread; the left antenna, right hind wing and left hind leg are missing. There is insect feeding damage to the thorax and abdomen.

The other specimens have locality labels of “Grenade” or “Andalusie” and may not be part of the type series if

Pictet only used the specimens from San Ildefonso for his description.

Sialis nigripes Pictet, 1865

NEUROPTERA

Ascalaphidae

junodi Weele, 1909: 73-74 [*Allocormodes*].

Transvaal (Genfer Museum und Sammlung Navás). One ♂ and two ♀.

One ♀ syntype. A ♀ specimen with labels: “Transvaal, Junod Miss., 624 25” [printed on pink paper]; “167” [handwritten on a square of white paper]; “*Allocormodes Junodi* vdW Type” [handwritten on white card with printed margin]; “Weele Typus” [handwritten on pink card with “Typus” and margin printed]. Specimen set with wings spread. Although the number on the data label has the same format as the MHNG acquisition register, the specimen does not correspond to the entry in the register.

Allocormodes junodi Weele, 1909

mexicanus Weele, 1909: 122-123 [*Colobopterus*].

Mexico und Honduras (Genfer Mus., Paris Mus., Stettiner Mus., Wiener Mus., Züricher Mus.). Two ♂ and three ♀. One ♂ syntype. A ♂ specimen with labels: “620 48, Cordova, Mexique, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Cordova, Mexique (t. chaudes)” [handwritten on white paper]; “160” [handwritten on a square of white paper]; “*Colobopterus mexicanus* Type vdW” [handwritten on white card with printed margin]; “Syntypus” [printed on red paper]. Specimen set with wings spread; the tip of the right antenna, the right front leg, the tarsi of the left front leg, the tarsi of the right middle leg and the entire left middle leg are missing. A set of tarsi have been glued to the left middle coxa. The hind legs, one lacking the last tarsal segment, are detached and glued to a card mount on the original pin. The locality label mentioning “t. chaudes” suggests that this specimen was probably collected on Saussure’s expedition and not part of Pictet’s collection.

Ameropterus mexicanus (Weele, 1909)

papio Tjeder, 1992: 80-84 [*Melambrotus*].

S. Africa, Cape Prov., Graaff Reinet. ♂ holotype, seven ♂ paratypes and four ♀ paratypes.

One ♂ paratype. A ♂ specimen with labels: “620 73, Cap b. sp., Brady coll.” [handwritten on ruled white card]; “166” [handwritten on a square of white paper]; “var of *Melambrotus simia* M.L. det. v d Weele” [handwritten on white card with printed margin]; “Paratypus ♂, *Melambrotus papio* Tjed., Bo Tjeder 1968” [handwritten on red card with “Paratypus” printed]. Specimen set with wings spread: the right antenna and right front leg are missing and the right hind wing has a torn hind margin. Tjeder examined this specimen, which Weele (1909:

82) had identified and illustrated as *M. simia* McLachlan, and included it as a paratype of *M. papio*. The holotype is deposited in the TMSA.

Melambrotus papio Tjeder, 1992

Berothidae

ferruginea Handschin, 1935: 701-703 [*Trichoberotha*]. [Australia] Burnside Station, N.T. Twelve specimens (including ♂ and ♀).

One ♀ syntype. A ♀ specimen with labels: “Marrakai, N.T., May 1931, HANDSCHIN” [printed on white card]; “Trichoberotha ferruginea E.H., Paratype” [handwritten on pinkish paper]; “Syntypus” [printed on red paper]. The specimen is set with wings folded, mounted on a micropin fixed to a section of pith on the main pin; the end of the left antenna is missing and the left hind leg is detached and glued to a card mount on the original pin. The locality on the label does not match that given in the original description, but it is geographically very close to it. No holotype was designated in the original description and so the specimens are all syntypes despite the labels affixed by Handschin. The other syntypes are in the NHMB.

Trichoberotha ferruginea Handschin, 1935

Chrysopidae

geniculata Pictet, 1865: 62, pl. 7, figs 5-8 [*Chrysopa*].

Les bords de Darro, près de Grenade. One specimen (sex unspecified).

♂ holotype. A ♂ specimen with labels: “620 48, Grenade, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Grenade Juin 1859” [printed on white card]; “60” [handwritten on a square of white paper]; “Chrysopa geniculata Ed. Pictet” [handwritten on white paper]; “Chrysopa viridana Schn. det. H. Hölzel 1971” [handwritten on white card with “Chrysopa”, “det. H. Hölzel” and margin printed]; “Holotypus” [printed on red card]; “Muséum Genève, Holotypus ♂ Chrysopa geniculata Pictet 1865” [handwritten on white card with “Muséum Genève” and margin printed]. Specimen set with wings folded; as noted by Hölzel (1973: 67) the head, prothorax and the left wings are missing. The left front leg and both middle legs are also lost.

A junior synonym of *Chrysopa viridiana* Schneider, 1845

granadensis Pictet, 1865: 69, pl. 6, figs 5-8 [*Chrysopa*].

Environs de Grenade. One specimen (sex unspecified).

♂ holotype. A ♂ specimen with labels: “620 48, Grenade, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Grenade Juin 1859” [printed on white card]; “Chrysopa granadensis Ed Pictet” [handwritten on white paper]; “Ch. granadensis Pict.” [handwritten on white paper]; “Holotypus” [printed on red card]; “Muséum Genève, Holotypus ♂ Chrysopa granadensis Pictet 1865” [handwritten on white card with “Muséum Genève” and margin printed]. Specimen set with wings folded; the left forewing is lost and the

right forewing is detached and glued to a card mount on the original pin. Part of the tibia and the tarsi of the left hind leg are lost. As noted by Hölzel (1973: 72) there are two other specimens collected by Pictet placed under this name, but these have Navás’ identification labels and are not part of the type series.

Pseudomallada granadensis (Pictet, 1865)

guadarramensis Pictet, 1865: 65-66, pl. 6, figs 1-4 [*Chrysopa*].

San Ildefonso, Sierra Guadarrama. One specimen (sex unspecified).

♀ holotype. A ♀ specimen with labels: “620 48 Granjas, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Granjas Juillet 1859” [printed on white card]; “71” [handwritten on a square of white card]; “Chrysopa guadarramensis Ed Pictet” [handwritten on white paper]; “Holotypus” [printed on red card]; “museum Genève, Holotype ♀, Chrysopa guadarramensis Pictet 1865” [handwritten on white card with “Muséum Genève” and margin printed]. Specimen set with wings roughly folded; most of both antennae, the tarsi of the left hind leg and the entire right hind leg are lost. This specimen was examined by Hölzel (1973: 81). *Nineta guadarramensis* (Pictet, 1865)

meyeri Pictet, 1865: 62-63, pl. 8, figs 5-8 [*Chrysopa*].

Eaux-Bonnes, Pyrénées. Unspecified series.

♀ lectotype (designated by Hölzel, 1973: 69) and one paralectotype without abdomen. A ♀ specimen with labels: “629 48, Pyrénées, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Pyrénées, Juillet 1859” [printed on white card]; “96” [handwritten on a square of white paper]; “Chrysopa meyeri Ed Pictet” [handwritten on white paper]; “Ch. Meyeri Pict” [handwritten on white paper]; “Anisochrysa flavifrons (Brauer) det. H. Hölzel 1971” [handwritten on white card with “det. H. Hölzel 197” printed]; “Lectotypus Chrysopa meyeri Pictet 1865, H. Hölzel 1971” [handwritten on red card]; “Muséum Genève, Lectotypus ♀, Chrysopa meyeri Pictet 1865” [handwritten on white card with “Muséum Genève” and margin printed]. Specimen set with wings roughly folded; both antennae, the right forewing and the tarsi of both middle legs are missing.

A specimen with labels: “629 48, Pyrénées, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Pyrénées, Juillet 1859” [printed on white card]; “94” [handwritten on a square of white paper]; “Ch. Meyeri Pict” [handwritten on white paper]; “vorgefunden als: meyeri Pictet H. Hölzel 1971” [typewritten on white card with “meyer Pictet” handwritten]; “Chrysotropia ciliate (Wesmael), det. H. Hölzel 1971” [handwritten on white card with “det. H. Hölzel 197” printed]; “Paralectotype of C. meyeri Pictet, 1865 Hollier 2016” [handwritten on orange card]. Specimen set with wings roughly spread; as noted by

Hölzel, the abdomen is missing. The end of the right antenna is missing, the left antenna is detached but stuck to the left front and middle legs, the right front leg, which lacks the tarsi, is detached but stuck to the right antenna, the right middle leg and left hind leg are lost and the right hind leg lacks the tarsi. McLachlan (1880: 62) noted before Hölzel (1973) that the type specimens were not conspecific.

A junior synonym of *Pseudomallada flavifrons nigropunctatus* (Pictet, 1865)

monticola Pictet, 1865: 70, pl. 7, figs 1-4 [*Chrysopa*].

Eaux-Bonnes. Unspecified series.

♀ lectotype (designated by Hölzel, 1973: 69), one ♂ paralectotype and one paralectotype without abdomen. A ♀ specimen with labels: “629 48, Pyrénées, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Pyrénées, Juillet 1859” [printed on white card]; “96” [handwritten on a square of white paper]; “Anisochrysa flavifrons (Brauer) det. H. Hölzel 1971” [handwritten on white card with “det. H. Hölzel 197” printed]; “Lectotypus ♀ *Chrysopa monticola* Pictet 1865, H. Hölzel 1971” [handwritten on red card]; “Muséum Genève, Lectotypus ♀, *Chrysopa monticola* Pictet 1865” [handwritten on white card with “Muséum Genève” and margin printed]. Specimen set with wings roughly folded; the left antenna is lost and there is some insect feeding damage.

A ♂ specimen with labels: “629 48, Pyrénées, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Pyrénées, Juillet 1859” [printed on white card]; “92” [handwritten on a square of white paper]; “Ch. monticola Pict.” [handwritten on white paper]; “*Chrysopa monticola*” and “Ed Pictet” [handwritten on opposite sides of a piece of white paper]; “vorgefunden als: *monticola* Pictet H. Hölzel 1971” [typewritten on white card with “meyerii Pictet” handwritten]; “*Anisochrysa flavifrons* (Brauer) det. H. Hölzel 1971” [handwritten on white card with “det. H. Hölzel 197” printed]; “Paralectotype of *C. monticola* Pictet, 1865, Hollier 2016” [handwritten on orange card]. Specimen set with wings roughly folded; as Hölzel noted, the head and prothorax are missing. About a third of the right hind wing is lost.

A specimen with labels: “629 48, Pyrénées, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Pyrénées, Juillet 1859” [printed on white card]; “86” [handwritten on a square of white paper]; “Ch. monticola Pict.” [handwritten on white paper]; “vorgefunden als: *monticola* Pictet H. Hölzel 1971” [typewritten on white card with “meyerii Pictet” handwritten]; “*Anisochrysa flavifrons* (Brauer) det. H. Hölzel 1971” [handwritten on white card with “det. H. Hölzel 197” printed]; “Paralectotype of *C. monticola* Pictet, 1865, Hollier 2016” [handwritten on orange card]. Only the head and prothorax remain, with the forewings glued to the latter. The right antenna and left front leg are missing.

A junior synonym of *Pseudomallada flavifrons nigropunctatus* (Pictet, 1865)

nigropunctata Pictet, 1865: 60-61, pl. 8, figs 1-4 [*Chrysopa*].

Environs de Grenade. Many specimens (sex unspecified). Lectotype without abdomen (designated Hölzel, 1973: 69) and one paralectotype without abdomen. A specimen with labels: “620 48, Espagne, Coll. Pictet” [numerals handwritten on printed ruled card]; “115” [handwritten on a square of white card]; “Ch. nigropunctatus Pictet” [handwritten on white paper]; “Ch. flavifrons Br. v. nigropunctatus E.P., Long. Navás det.” [handwritten on white card with “Long. Navás det.” printed]; “*Anisochrysa flavifrons* (Brauer) det. H. Hölzel 1971” [handwritten on white card with “det. H. Hölzel 197” printed]; “Lectotypus *Chrysopa nigropunctata* Pictet 1865, H. Hölzel 1971” [handwritten on red card]; “Muséum Genève, Lectotypus, *Chrysopa nigropunctata* Pictet 1865” [handwritten on white card with “Muséum Genève” and margin printed]. Specimen set with wings roughly folded; as Hölzel noted, the abdomen is missing. There is insect feeding damage to the thorax; the left antenna, both hind legs and the left hind wing are also lost.

A specimen with labels: “620 48, Espagne, Coll. Pictet” [numerals handwritten on printed ruled card]; “124” [handwritten on a square of white card]; “*Chrysopa nigropunctata* Ed Pictet” [handwritten on white paper]; “Ch. nigropunctatus Pictet” [handwritten on white paper]; “*Anisochrysa flavifrons* (Brauer) det. H. Hölzel 1971” [handwritten on white card with “det. H. Hölzel 197” printed]; “Paralectotype *Chrysopa nigropunctata* Pictet, 1865 Hollier 2016” [handwritten on orange card]. Specimen set with wings roughly folded; as Hölzel noted, the abdomen is missing. There is insect feeding damage to the thorax; the head, prothorax, both front legs and the right middle leg are lost. Hölzel mentions another specimen, once in McLachlan’s collection and now in the BMNH, which might be a paralectotype.

Pseudomallada flavifrons nigropunctatus (Pictet, 1865)

picteti McLachlan, 1880: 63 [*Chrysopa*].

Replacement name proposed for *C. thoracica* Pictet, 1865, a junior homonym of *C. thoracica* Walker, 1853. For the type specimens see *C. thoracica*.

Pseudomallada picteti (McLachlan, 1880)

riparia Pictet, 1865: 69-70, pl. 7, figs 9-12 [*Chrysopa*].

Les bords du Xenil; Eaux-Bonnes. More than one specimen (sex unspecified).

Lectotype without abdomen (designated by Hölzel, 1973: 69) and one paralectotype without abdomen. A specimen with labels: “620 48, Grenade, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Grenade Juin 1859” [printed on white card]; “*Chrysopa riparia* Ed Pictet” [handwritten on

white paper]; “Ch. riparia Pict.” [handwritten on white paper]; “Anisochrysa flavifrons (Brauer) det. H. Hölzel 1971” [handwritten on white card with “det. H. Hölzel 197” printed]; “Lectotypus Chrysopa riparia Pictet 1865, H. Hölzel 1971” [handwritten on red card]; “Muséum Genève, Lectotypus, Chrysopa riparia Pictet 1865” Handwritten on white card with “Muséum Genève” and margin printed]. Specimen set with wings roughly folded; as Holzel noted, the abdomen is lost. The head is missing, there is insect feeding damage to the thorax, the right hind wing is missing and both forewings lack the ends.

A specimen with labels: “620 48, Grenade, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “99” [handwritten on a square of white paper]; “Ch. riparia Pict.” [handwritten on white paper]; “vorgefunden als: riparia Pictet, H. Hölzel 1971” [typed on white card with “riparia Pictet” handwritten]; “Anisochrysa flavifrons (Brauer) det. H. Hölzel 1971” [handwritten on white card with “det. H. Hölzel 197” printed]; “Paralectotype Chrysopa riparia Pictet, 1865 Hollier 2016” [handwritten on orange card]. There is evidence of insect feeding damage on the thorax, and everything apart from the head, part of the prothorax, the right front leg and the right front wing is lost. Part of a detached wing is glued to the museum data label.

A junior synonym of *Pseudomallada flavifrons nigropunctatus* (Pictet, 1865)

thoracica Pictet, 1865: 67, pl. 6, figs 9-12 [*Chrysopa*].

Environs de Grenade. Unspecified series.

♂ lectotype (designated by Hölzel, 1973: 74) and a ♂ paralectotype. A ♂ specimen with labels: “620 48, Espagne, Coll. Pictet” [numerals handwritten on printed ruled card]; “116” [handwritten on a square of white card]; “Ch. prasina Burm. v. Picteti McLach., Long. Navás det.” [handwritten on white card with “Long. Navás det.” printed]; “Anisochrysa picteti McL (= thoracica Pictet), det. H. Hölzel 1971” [handwritten on white card with “det. H. Hölzel 197” printed]; “Lectotypus ♂, Chrysopa Thoracica Pictet 1865, H. Hölzel 1971” [handwritten on red card]. Specimen set with wings roughly folded; much of the left antenna and the entire right forewing are missing.

A ♂ specimen with labels: “620 48 Granjas, Espagne, Coll. Pictet” [handwritten on ruled white card with “Espagne, Coll. Pictet” printed]; “Granjas Juillet 1859” [printed on white card]; “102” [handwritten on white paper]; “Chrysopa thoracica Ed Pictet” [handwritten on whitish paper, somewhat torn]; “Ch. microcephala Brauer” [handwritten on white paper]; “vorgefunden als: thoracica Pictet, H. Hölzel 1971” [typed on white card with “thoracica Pictet” handwritten]; “Cunctochrysa albolineata (Killington) det. H. Hölzel 1971” [handwritten on white card with “det. H. Hölzel 197” printed]; “Paralectotype of C. thoracica Pictet, 1865, Hollier 2016” [handwritten on orange card]. Specimen

set with wings roughly folded; the right antenna, the right forewing and about two thirds of the left forewing are missing.

It is unfortunate that the specimen most clearly from the type locality belongs to a species different from the lectotype. McLachlan (1880: 63), who examined a single specimen collected by Pictet, recognised that the name *C. thoracica* Pictet was a junior homonym of *C. thoracica* Walker, 1853 and proposed the replacement name *C. picteti*.

Replaced by *Pseudomallada picteti* (McLachlan, 1880)

vulgaris mista Navás, 1913c: 279-280 [*Chrysopa*].

Turkestan; Fergana, 1800 m, Dr Weber-Bauler (Mus. Genevae). Unspecified series.

One ♀ syntype. A ♀ specimen with labels: “Turkestan oriental., Fergana, Alt. 1800 m, Dr Weber-Bauler” [printed on white paper with “1800 m” handwritten]; “Ch. vulgaris Sch., var. mista Nav., Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Typus” [handwritten on pink paper]. Specimen set with wings spread; most of the left antenna and the right middle leg are lost. All of the wings are tattered along the hind margin. Because the type series was unspecified, the specimen should be regarded as a syntype.

A junior synonym of *Chrysoperla carnea* (Stephens, 1836)

Dilaridae

anatolicus Aspöck, Liu & Aspöck, 2015:127-130 [*Dilar*].

Kizilçahamam, Asia minor. ♂ Holotype, eight ♂ paratypes and two ♀ paratypes.

One ♂ paratype. A single ♂ specimen with labels: “620 48 Taurus, Asia min. Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Dilar syriacus Nav. ♂” [handwritten by Navas on white card]; “Paratype of Dilar anatolicus U. Aspöck & X. Liu & H. Aspöck 2015” [printed on red card]. The specimen lacks the head, prothorax and front legs, the tibia and tarsi of the right middle leg and the entire right hind leg. The abdomen is detached and cleared, and stored in a micro-tube on a separate pin with its own printed identification label. The holotype is in the Aspöck collection in Vienna and will eventually be deposited in the NHMW.

Dilar anatolicus Aspöck, Liu & Aspöck, 2015

fuscus Aspöck, Liu & Aspöck, 2015: 131-132 [*Dilar*].

Süd-west-Anatolien-Exp., Prov. Aydin, Nazilli-Beydag. ♀ holotype, three ♀ paratypes.

One ♀ paratype. A single ♀ specimen with labels: “620 48 Asia min. Coll. Pictet” [handwritten on ruled white card with “Asia min.” and “Coll. Pictet” printed]; “Dilar syriacus Nav. ♀ Cotypus” [handwritten by Navas on white card]; “Paratypus ♀ Dilar fuscus U. Aspöck & X. Liu & H. Aspöck, 2015” [printed on red card]. The specimen lacks the left antenna, the last tarsal segment

of the left front leg, the middle and hind legs and the right hind wing. The abdomen is detached and cleared, and stored in a micro-tube on a separate pin with its own printed identification label. Navás (1909) described *D. syriacus* from a single damaged ♂ and so this ♀ cannot be part of his type series despite his label. The holotype is in the Aspöck collection in Vienna and will eventually be deposited in the NHMW.

Dilar fuscus Aspöck, Liu & Aspöck, 2015

nevadensis Rambur, 1838: pl. 9, figs 4-5 [*Dilar*].

[Andalusie]. Unspecified number of ♂ and ♀.

One ♂ syntype. A single ♂ specimen with labels: “620 48, S. Nevada, Espagne, Coll. Pictet” [handwritten on ruled white card with “Espagne” and “Coll. Pictet” printed]; “*D. nevadensis* Rmb. Serr. Nevada” [handwritten on white card]; “M Rambur” [handwritten on white paper]; “*Dilar* (mihi) nevadensis (mihi) S. Nevada” [handwritten on white paper]; “Syntypus” [printed on red paper]. The specimen has lost most of the left antenna, the entire right antenna, about half of the left front wing, most of the right front and hind wings, the last tarsal segment of the right middle leg and the end of the abdomen. The original publication is the illustration of a ♂ and ♀ without a description (see Higgins, 1958). Rambur (1842: 445-446) gave a description and noted “J’ai rencontré assez communément ce curieux Névroptère, aux environs de Grenade, dans les petits bois des parties élevées de la Sierra Nevada, pendant l’été” and that the size was variable. According to Navás (1908-1909: 632) there are syntypes of both sexes in the ISNB.

Dilar nevadensis Rambur, 1838

Mantispidae

aphavexelte Aspöck & Aspöck, 1994: 110-112 [*Mantispa*].

O-Samothraki, Anomeria, Griechenland. ♂ holotype, 55 ♂ paratypes and 49 ♀ paratypes.

Two ♂ paratypes and three ♀ paratypes. A ♀ specimen with labels: “V-C 18.6.-20.7.” [handwritten on white card]; “*Mantispa styriaca*” [handwritten on white card]; “*Perlamantispa icterica* (Pictet, 1865) ♀ néotype dét. C. POIVRE, 1981” [handwritten on white card with “dét. C. POIVRE, 19” printed]; “Paratypus ♀ *Mantispa aphavexelte* U. Aspöck & H. Aspöck 1994” [handwritten on red card]. Specimen set with wings spread; the right antenna is missing and the tip of the right front wing is detached and glued to a card mount secured on the original pin. This specimen was collected by H. K. Daicker in Cannet-des-Maures (Var, France). Poivre (1982c: 669) designated this specimen as the neotype of *M. perla icterica* Pictet, but part of the original type series exists and the designation is therefore invalid.

The other paratypes are in three vials in alcohol, with some parts mounted on nine microscopic slides: (1) a slide with antennae and sclerite and the handwritten labels “Forêt dom. de Palayson (Var), (à côté du Mui),

VII.1977, Y. Séméria” and “*Perlamantispa icterica* ♂ antennes, col, dét. POIVRE 1982, M.A. 2” and the printed label “Paratype M. aphavexelte Asp.”; (2) a slide with dissected mouthparts and the handwritten labels “Forêt dom. de Palayson (Var), (à côté du Mui), VII.1977, Y. Séméria” and “*Perlamantispa icterica* ♂, labium, dét. POIVRE 1982, M.A. 2” and the printed label “Paratype M. aphavexelte Asp.”; (3) a slide with a head and the handwritten labels “Forêt dom. de Palayson (Var), VII.1977, Y. Séméria” and “*Perlamantispa icterica* ♂, tête, dét. POIVRE 1982, M.A. 2” and the printed label “Paratype M. aphavexelte Asp.”; (4) a slide with two wings and the handwritten labels “Forêt dom. de Palayson (Var), 15.VII.1977, Y. Séméria” and “*Perlamantispa icterica* ♂, ailes droites, dét. POIVRE 1982, M.A. 2” and the printed label “Paratype M. aphavexelte Asp.”; (5) a slide with ♂ genitalia and the handwritten labels “Forêt dom. de Palayson (Var), 15.VII.1977, Y. Séméria” and “*Perlamantispa perla icterica* ♂ genitalia, dét. POIVRE 1982, M.A. 2” and the printed label “Paratype M. aphavexelte Asp.”; (6) a slide with ♂ genitalia and the handwritten labels “Forêt dom. de Palayson (Var), VII.1977, Y. Séméria” and “*Perlamantispa perla icterica* ♂ genitalia, dét. POIVRE 1982, M.A. 2” and the printed label “Paratype M. aphavexelte Asp.”; (7) a slide with cleared abdominal parts and the handwritten labels “Forêt dom. de Palayson (Var), 15.VII.1977, Y. Séméria” and “*Perlamantispa perla icterica* ♂ tergites et sternites abdominaux, organ d’Eltingham, dét. POIVRE 1982, M.A. 2” and the printed label “Paratype M. aphavexelte Asp.”; (8) a slide with two legs and the handwritten labels “Forêt dom. de Palayson (Var), 15.VII.1977, Y. Séméria” and “*Perlamantispa perla icterica* ♀, P2-P3 gauches, dét. POIVRE 1982, M.A. 2” and the printed label “Paratype M. aphavexelte Asp.”; and (9) a slide with terminalia and the handwritten labels “Forêt dom. de Palayson (Var), VII.1977, Y. Séméria” and “*Perlamantispa icterica* ♀, terminalia, dét. POIVRE 1982, M.A. 2” and the printed label “Paratype M. aphavexelte Asp.”

The three vials each have the handwritten label “*Perlamantispa icterica* (Pictet, 1865) 2♂, 5♀ [sic], Dét. C. POIVRE, 1982, Forêt domaniale de Palayson (Var), 15-18.VII.1977, leg. Y. Séméria, Dét. par erreur *P. perla* (cf. POIVRE, 1981, p. 159)” and the printed label Paratype M. aphavexelte Asp.” One vial contains the fragments of two ♂, one lacking the terminalia, the other lacking the head, right wings and abdomen. The second vial contains a ♀ with the abdomen and legs detached. The third vial contains an intact ♀. The holotype is in the Aspöck collection in Vienna and will eventually be deposited in the NHMW.

Mantispa aphavexelte Aspöck & Aspöck, 1994

austroafrica Poivre, 1984: 642-645 [*Perlamantispa*].

Afrique méridionale. One ♀.

♀ holotype. The ♀ holotype is mounted on four microscopic slides: (1) a slide with the head and the

handwritten labels “Afrique méridionale, Delalande, Coll. Pictet dét. C. Poivre 1983” and “Perlamantispa austroafrica, holotype ♀, tête, M.A. 2”; (2) a slide with the antennae and dissected mouthparts and the handwritten labels “Afrique méridionale, Delalande, Coll. Pictet dét. C. Poivre 1983” and “Perlamantispa austroafrica, holotype ♀, labium, antennes, sclérites cerv., M.A. 2”; (3) a slide with two wings and the handwritten labels “Afrique méridionale, Delalande, Coll. Pictet dét. C. Poivre 1983” and “Perlamantispa austroafrica, holotype ♀, ailes droites face tergale, M.A. 2”; (4) a slide with the terminalia and the handwritten labels “Afrique méridionale, Delalande, Coll. Pictet dét. C. Poivre 1983” and “Perlamantispa austroafrica, holotype ♀, terminalia, M.A. 2”. The three remaining fragments are stored dry in a glass vial secured through the cork stopper. The pin has the labels: “620 44 Afr. mérid, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Afrique Delalande” [handwritten on a circle of white paper]; “Perlamantispa austroafrica holotype ♀ dét. C. Poivre 1983” [handwritten on white card with “dét. C. Poivre 19” printed]; “Holotypus” [printed on red card]. The vial contains the prothorax, right front leg, mesothorax and middle legs, the metathorax, left hind wing and hind legs and a section of abdomen.

Sagittalata austroafrica (Poivre, 1984)

bitschi Poivre, 1982a: 181-183 [*Sagittalata*].

Côte d’Ivoire, Lamto. ♂ holotype, one ♂ paratype and one ♀ paratype.

♂ holotype, one ♂ paratype and one ♀ paratype. The ♂ holotype is mounted on six microscopic slides: (1) a slide with head, prothorax and front legs and the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Sagittalata bitschi Poivre, tête thorax I, holotype ♂, M.A. 2”; (2) a slide with the antennae and dissected mouthparts and the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Sagittalata bitschi Poivre, labium, antennes, col, holotype ♂, M.A. 2”; (3) a slide with the meso- and metathorax thorax and legs and the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Sagittalata bitschi Poivre, holotype ♂, thorax II-III, M.A. 2”; (4) a slide with the wings and the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Sagittalata bitschi Poivre, holotype ♂, M.A. 2”; (5) a slide with the cleared abdomen and the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Sagittalata bitschi Poivre, holotype ♂, abdomen, M.A. 2”; (6) a slide with the terminalia and the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Sagittalata bitschi Poivre, holotype ♂, terminalia, M.A. 2”.

The paratypes are in alcohol with the label “Sagittalata bitschi Poivre, paratypes ♂ et ♀, Côte d’Ivoire, Lamto, XII.1975, J. Bitsch”. The terminalia of the ♀ is mounted on a slide with the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Sagittalata bitschi

Poivre, paratype ♀, terminalia, M.A. 2”. The container of this slide is glued to the lid of the jar containing the paratypes. The ♀ paratype lacks the right front leg and the right hind leg from the middle of the femur.

Sagittalata bitschi Poivre, 1982

condei Poivre, 1982a: 183-187 [*Cercomantispa*].

Côte d’Ivoire, Adiopodoumé. ♂ holotype, two ♂ paratypes, six ♀ paratypes and one damaged paratype.

One ♂ paratype and three ♀ paratypes. A ♂ with labels: “COTE D’IVOIRE, Loc: Forêt du Banco, Date: X-1963, P. GRIVEAUD” [printed on white card with “X-1963” handwritten]; “O.R.S.T.O.M., I.D.E.R.T., Adiopoduoumé” [printed on white card]; “Cercomantispa condei Poivre, 1981, paratype ♂, det. C. Poivre, 1981” [handwritten on white card with “det. C. Poivre, 19” printed]; “Paratypus” [printed on orange card]. Specimen set with left wings spread and right wings folded; the left middle leg is missing.

Three ♀ specimens in alcohol, with the handwritten label “Cercomantispa condei Poivre, Côte d’Ivoire, Lamto, XII.1975, J. Bitsch, paratypes ♀”. One specimen lacks the entire abdomen; a second lacks about half of the abdomen. The holotype is in the MNHN.

Cercomantispa condei Poivre, 1982

decellei Poivre, 1982a: 187-191 [*Cercomantispa*].

Côte d’Ivoire, Lamto. ♂ holotype, fifteen ♂ paratypes and four ♀ paratypes.

♂ holotype, ten ♂ paratypes and four ♀ paratypes. The holotype is mounted on six microscopic slides: (1) a slide with the head and pronotum and the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Cercomantispa decellei Poivre, holotype ♂, tête, notum, M.A. 2”; (2) a slide with the antennae and dissected mouthparts and the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Cercomantispa decellei Poivre, holotype ♂, labium, col, antennes, M.A. 2”; (3) a slide with the legs and the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Cercomantispa decellei Poivre, holotype ♂, M.A. 2”; (4) a slide with the wings and the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Cercomantispa decellei Poivre, holotype ♂, M.A. 2”; (5) a slide with the terminalia and the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Cercomantispa decellei Poivre, holotype ♂, terminalia, M.A. 2”; (6) a slide with the cleared abdomen and the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “Cercomantispa decellei Poivre, holotype ♂, abdomen, M.A. 2”.

The paratypes are in alcohol with a handwritten label “Cercomantispa decellei Poivre, Paratypes (10♂♂, 4♀♀), Côte d’Ivoire, Lamto, XII.1975, J. Bitsch”. Most of the specimens are loose in a large tube but one ♂ and one ♀ are separated into smaller vials in the main tube. The head of the separate ♂ is mounted on a microscopic slide with the handwritten labels “Côte d’Ivoire, Lamto, XII.1975,

J. Bitsch” and “*Cercomantispa decellei* Poivre, paratype ♂, M.A. 2”, the antennae and cervical sclerite are loose in the vial. The separate ♀ has the abdomen detached and the terminalia are mounted on a microscopic slide with the handwritten labels “Côte d’Ivoire, Lamto, XII.1975, J. Bitsch” and “*Cercomantispa decellei* Poivre, paratype ♀, terminalia, M.A. 2”, the left antenna is malformed. One of the ♂ has lost the right front leg.

Cercomantispa decellei Poivre, 1982

delamarei Poivre, 1982a: 175-178 [*Sagittalata*].

Côte d’Ivoire, Forêt du Banco. ♂ holotype, one ♂ paratype and seven ♀ paratypes.

One ♂ paratype and two ♀ paratypes. A ♂ with labels: “COTE D’IVOIRE, Loc: Forêt du Banco, Date: X-1963, P. GRIVEAUD” [printed on white card with “X-1963” handwritten]; “O.R.S.T.O.M., I.D.E.R.T., Adiopodoumé” [printed on white card]; “*Sagittalata delamarei* Poivre, 1981, paratype ♂, det. C. Poivre, 1981” [handwritten on white card with “det. C. Poivre, 19” printed]; “Paratypus” [printed on orange card]. Specimen set with left wings spread and right wings folded; the tip of the left antenna is missing.

A ♀ with labels: “COTE D’IVOIRE, Loc: Forêt du Banco, Date: X-1963, P. GRIVEAUD” [printed on white card with “X-1963” handwritten]; “O.R.S.T.O.M., I.D.E.R.T., Adiopodoumé” [printed on white card]; “*Sagittalata delamarei* Poivre, 1981, paratype ♂, det. C. Poivre, 1981” [handwritten on white card with “det. C. Poivre, 19” printed]; “Paratypus” [printed on orange card]. Specimen set with left wings spread and right wings folded; the left antenna, left front leg, and right hind leg are lost.

A ♀ specimen in alcohol with labels: “COTE-D’IVOIRE: Abidjan: Adiopodoumé, à la lumière. 18.-23.III.1977, leg. I. Löbl (27)” [typewritten on thin white card]; “*Sagittalata delamarei* Poivre, paratype ♀, déterminé Poivre, 22.V.1979” [handwritten on white paper].

The holotype is in the MNHN.

Sagittalata delamerei Poivre, 1982

hauseri Poivre, 1982b: 11-13 [*Mantispa*].

Yougoslavie (Istrie), Rovinj. ♀ holotype.

♀ holotype. A ♀ specimen in alcohol, with dissected parts mounted on two slides: (1) a side with the antennae and dissected mouthparts and the handwritten labels “Yougoslavie (Istrie) Station Ju-74/1, 14.VI.1974, B. Hauser” and “*Mantispa hauseri* Poivre, Holotype ♀ Maxilles, labium, antennes, col. M.A. 2”; (2) a slide with the right wings and the handwritten labels “Yougoslavie (Istrie) Station Ju-74/1, 14.VI.1974, B. Hauser” and “*Mantispa hauseri* Poivre, Holotype ♀ Ailes droites. M.A. 2”. The rest of the specimen is in two vials placed in a larger tube accompanied by a handwritten label “*Mantispa hauseri* Poivre, Holotype ♀, Station Ju-74/1: Yougoslavie (Istrie) Pinède proche de la mer près Rovinj, 14.VI.1974, B. Hauser.” The head is in one vial, the rest of the body in the other, with the locality code “Ju74/1”

typed on a strip of card. The container holding the slides is glued to the lid of the jar containing the rest of the specimen.

A junior synonym of *Mantispa styriaca* (Poda, 1761)

ivoiriensis Poivre, 1982b: 5-8 [*Pseudoclimaciella*].

Côte d’Ivoire, Forêt du Banco. ♂ holotype, seven ♂ paratypes and four ♀ paratypes.

One ♂ paratype and one ♀ paratype. A ♂ specimen with labels: “COTE D’IVOIRE, Loc: Forêt du Banco, Date: X-1963, P. GRIVEAUD” [printed on white card with “X-1963” handwritten]; “O.R.S.T.O.M., I.D.E.R.T., Adiopodoumé” [printed on white card]; “*Pseudoclimaciella ivoiriensis* Poivre, 1981, paratype ♂, det. C. Poivre, 1981” [handwritten on white card with “det. C. Poivre, 19” printed]; “Paratypus” [printed on orange card]. Specimen set with left wings spread and right wings folded; the right middle leg is missing.

A ♀ specimen with labels: “COTE D’IVOIRE, Loc: Forêt du Banco, Date: X-1963, P. GRIVEAUD” [printed on white card with “X-1963” handwritten]; “O.R.S.T.O.M., I.D.E.R.T., Adiopodoumé” [printed on white card]; “*Pseudoclimaciella ivoiriensis* Poivre, 1981, paratype ♀, det. C. Poivre, 1981” [handwritten on white card with “det. C. Poivre, 19” printed]; “Paratypus” [printed on orange card]. Specimen set with left wings spread and right wings folded. The holotype is in the MNHN.

Pseudoclimaciella ivoiriensis Poivre, 1982

ndjallai Poivre, 1981: 81-84 [*Cercomantispa*].

Cameroun, Ngoekele-Yaounde. ♂ holotype.

♂ holotype. The holotype is mounted on six microscopic slides: (1) a slide with the antennae and mouthparts and the handwritten labels “NGOEKELE-YAOUNDE, CAMEROUN, XII.1976, M. Ndjalla” and “*Cercomantispa ndjallai* POIVRE Holotype ♂, labre, labium, antennes, col. M.A. 2”; (2) a slide with the front legs and head and the handwritten labels “YAOUNDE – CAMEROUN” and “*Cercomantispa ndjallai* POIVRE Holotype ♂”; (3) a slide with the wings and the handwritten labels “NGOEKELE-YAOUNDE, CAMEROUN, XII.1976, M. Ndjalla” and “*Cercomantispa ndjallai* POIVRE Holotype ♂, M.A. 2”; (4) a slide with three legs and the handwritten labels “NGOEKELE-YAOUNDE, CAMEROUN, XII.1976, M. Ndjalla” and “*Cercomantispa ndjallai* POIVRE Holotype ♂, P2-P3, M.A. 2”; (5) a slide with part of the abdomen and the handwritten labels “NGOEKELE-YAOUNDE, CAMEROUN, XII.1976, M. Ndjalla” and “*Cercomantispa ndjallai* POIVRE Holotype ♂, tergites 3-6, M.A. 2”; (6) a slide with the Terminalia and the handwritten labels “NGOEKELE-YAOUNDE, CAMEROUN, XII.1976, M. Ndjalla” and “*Cercomantispa ndjallai* POIVRE Holotype ♂, terminalia, M.A. 2”. The rest of the specimen is in alcohol with the handwritten label “corps intestine: *Cercomantispa ndjallai*, Holotype ♂, NGOEKELE-YAOUNDE, CAMEROUN, XII.1976, M. Ndjalla”.

Cercomantispa ndjallai Poivre, 1981

perla icterica Pictet, 1865: 58, pl. 4, figs 6-8 [*Mantispa*]. San Ildefonso. Unspecified series.

Two ♀ syntypes. A ♀ with labels: “620 48 Granjas, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Granjas Juillet 1859” [printed on white card]; “Probable syntype of *M. perla icterica* Pictet, Hollier 2011” [handwritten on red paper]. Specimen set with wings folded; the tips of the right wings are missing.

A ♀ with labels: “620 48 Granjas, Espagne, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Granjas Juillet 1859” [printed on white card]; “Probable syntype of *M. perla icterica* Pictet, Hollier 2011” [handwritten on red paper]. Specimen set with wings roughly folded; the tip of the left antenna is missing.

These specimens are illustrated in Monserrat (2014). There is a further syntype, originally from Hagen’s collection, in the MCZC. Aspöck & Aspöck (1994) referred to the latter as the holotype and if this is considered an inadvertent lectotype designation the specimens in the MHNG are paralectotypes. Poivre (1982c: 669) designated a neotype, but this is clearly invalid because part of the original type series exists. He was correct in identifying the specimens as distinct from *Mantispa perla* however, and his invalid neotype and the associated specimens later became paratypes of *Mantispa aphavexelte* Aspöck & Aspöck, 1994 (see above).

A junior synonym of *Mantispa perla* (Pallas, 1772)

semeriai Poivre, 1981: 78-81 [*Sagittalata*].

Cameroun, Gachiga. ♀ holotype.

♀ holotype. A ♀ specimen in alcohol with dissected parts on five microscopic slides: (1) a slide with the terminalia and the handwritten labels “Gachiga (Garoua) Nord Cameroun, X.1976 M. Ndjalla” and “Sagittalata semeriai Holotype ♀, Terminalia, Poivre, M.A. 2”; (2) a slide with the middle and hind legs and the handwritten labels “Gachiga (Garoua) Nord Cameroun, X.1976 M. Ndjalla” and “Sagittalata semeriai Holotype ♀, P2-P3, Poivre, M.A. 2”; (3) a slide with the wings and the handwritten labels “Gachiga (Garoua) Nord Cameroun, X.1976 M. Ndjalla” and “Sagittalata semeriai Holotype ♀, Poivre, M.A. 2”; (4) a slide with the antenna and dissected mouthparts and the handwritten labels “Gachiga (Garoua) Nord Cameroun, X.1976 M. Ndjalla” and “Sagittalata semeriai Holotype ♀, Poivre, M.A. 2”; (5) a slide with the front legs and the front of the head with the eyes, and the handwritten label “Sagittalata semeriai Holotype ♀, Cameroun”. The prothorax and part of the abdomen are in alcohol together with the handwritten labels “Pron – abd. Sagittalata semeriai Holotype ♀, Gachiga (Garoua) N. Cameroun X.1976” and “Sagittalata semeriai n.sp. ♀”.

Sagittalata semeriai Poivre, 1981

Myrmeliontidae

additus Navás, 1914: 642 [*Macronemurus*].

Sur de Túnez (Mus. de Ginebra). Unspecified number of ♂.

One ♂ syntype. A ♂ with labels: “TUNIS SUD” [printed on pink paper]; “*Macronemurus additus* ♂ Nav., Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Typus” [handwritten on pink paper]. Specimen set with wings spread; the left middle leg is missing. The abdomen is laterally compressed. Since the type series was unspecified, the specimen should be regarded as a syntype.

A junior synonym of *Macronemurus elegantulus* McLachlan, 1898

antennata Navás, 1914: 644-645 [*Creagris*].

Desierto de Kosseir, Coll. Pictet (Mus. de Ginebra). One damaged ♂ and two ♀.

One ♂ syntype and one syntype without abdomen. A ♂ specimen with labels: “620 48, Kosseir, Afr. trop., Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Desert de Kosseir” [handwritten on white card]; “*Creagris antennata* Nav. Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Typus” [handwritten on pink card]. Specimen set with wings spread; the left antenna and the tarsi of the right front leg are missing. The left forewing is tattered and lacks the tip.

A specimen with labels: “620 48, Kosseir, Afr. trop., Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Desert de Kosseir” [handwritten on white card]; “*Creagris antennata* Nav. Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Typus” [handwritten on pink card]. Specimen set with wings spread; only two segments of the abdomen remain. There is insect feeding damage to the head and thorax, and the left eye is missing.

Creoleon antennata (Navás, 1914)

carinifrons Esben-Petersen, 1936: 204-206 [*Navasius*] [Belgian Congo] Chinkolobwe. One specimen (unspecified sex).

Holotype of unknown sex. A specimen with labels: “Ht Katanga, Chinkolobwe, 19-10-30, J. Romieux” [handwritten on white card with “Ht Katanga” and “J. Romieux” printed]; “*Navasius carinifrons* n.sp. det. Esben-Petersen” [handwritten on white card with “det. Esben-Petersen” and margin printed]; “TYPE” [printed on pink card]. Specimen set with wings spread; the left antenna, the last tarsal segment of the left front leg and both middle legs and most of the abdomen are missing. Esben-Petersen usually gave the sex of his types and so it is probable that the end of the abdomen had been lost when the species was described, although Mansell (1985) refers to the holotype as ♀.

Banksisus carinifrons (Esben-Petersen, 1936)

carli Navás, 1913a: 265-266 [*Palpares*].

Sénégal. One damaged specimen.

Holotype (sex unknown). A specimen with labels: “620 48, Senegal, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Sen.” [handwritten on white card]; “Palpares Carli Nav. Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Typus” [handwritten on pink card]; “Palpares latipennis, Prost det. 1995, syn. nouvelle” [handwritten on white card]. Specimen set with wings spread; there is insect feeding damage to the head and thorax. The right antenna, the eyes, the right middle leg and right hind leg are missing, as is the end of the abdomen. The specimen has been reinforced with glue near the pin.

A junior synonym of *Parapalpares latipennis* (Rambur, 1842)

cinnamomea Navás, 1913c: 276-277 [*Creagris*].

Ceylan, Voy. Humbert (Mus. Genevae). Unspecified series.

Three syntypes, all lacking part of the abdomen. A specimen with labels: “600 53, Ceylan, Voy. Humbert” [handwritten on ruled white card]; “Creagris cinnamomea Nav. Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Typus” [handwritten on pink card]. Specimen set with wings spread; the tarsi of the left front leg, the entire right front leg and both middle legs are lost, the end of the abdomen is missing, as is the tip of the right forewing.

A specimen with labels: “600 53, Ceylan, Voy. Humbert” [handwritten on ruled white card]; “Creagris spec” [handwritten (by Weele?) on white card with printed margin]; “Creagris cinnamomea Nav. Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Syntypus” [printed on red paper]. Specimen set with wings spread; both antennae, the tarsi of the right front leg and the tip of the abdomen are lost.

A specimen with labels: “600 53, Ceylan, Voy. Humbert” [handwritten on ruled white card]; “Creagris cinnamomea Nav. Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Syntypus” [printed on red paper]. Specimen set with wings spread; there is feeding damage to the thorax, and only the head, prothorax and part of the mesothorax with the left front wing remain.

Creoleon cinnamomeus (Navás, 1913)

elegantulus Esben-Petersen, 1936: 203-204 [*Navasius*].

[Belgian Congo] Chinkolobwe. One ♂.

♂ holotype. A ♂ specimen with labels: “Ht Katanga, Chinkolobwe, 18-9-30, J. Romieux” [handwritten on white card with “Ht Katanga” and “J. Romieux” printed]; “Navasius elegantulus n.sp. ♂ det. Esben-Petersen” [handwritten on white card with “det. Esben-Petersen” and margin printed]; “TYPE” [printed on pink card]. Specimen set with wings spread; the left antenna and all of the right legs are lost. The abdomen has been broken and roughly repaired with glue.

Bankisus elegantulus (Esben-Petersen, 1936)

homsii Navás, 1913b: 47-48 [*Myrmeleon*].

Argentina: Buenos Aires, Col. Pictet (Mus. de Ginebra). Unspecified series.

One ♀ syntype. A ♀ with labels: “620 48 Buenos Ayres, Argentina, Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “Buenos Ayres, coll. Meyer-Dür” [handwritten on white paper]; “Myrmeleon inconspicuus Rbr.” [handwritten (by Wheele?) on white card with printed margin]; “Myrmeleon Homsii Nav. Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Typus” [handwritten on pink card]. Specimen set with wings spread. Since the type series was unspecified, this specimen should be regarded as a syntype.

Myrmeleon homsi Navás, 1913

insperatus Navás, 1914: 633-634 [*Myrmelon*].

Cabo de Buena Esperanza, col. Pictet (Mus. de Ginebra). Unspecified series.

One ♀ syntype. A ♀ with labels: “620 48 Cap b. sp., Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “[Illegible], C.b.sp., Tollin[?]” [handwritten on white card]; “Myrmeleon insperatus Nav. Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Typus” [handwritten on pink card]. Specimen set with wings spread; the left antenna is lost. Since the type series was unspecified, this specimen should be regarded as a syntype.

Myrmeleon insperatus Navás, 1914

kabulensis Hölzel, 1972: 58-59 [*Distoleon*].

Afghanistan: 10km nördl. Kabul. ♂ holotype, nine ♂ paratypes and seven ♀ paratypes.

One ♀ paratype. A ♀ specimen with labels: “Asie mineure, Vilayet: Elâziz, Ergani-Maden, 12.8.39, J. Romieux” [handwritten on white card with “Asie mineure” and “J. Romieux” printed]; “Paratypus ♀ Distoleon kabulensis H. Hölzel 1972” [handwritten on red card with “Paratypus” printed]. Specimen set with wings spread; the tarsi of the right hind leg are missing.

Distoleon kabulensis Hölzel, 1972

laticollis Navás, 1913c: 278-279 [*Formicaleo*].

Syria, Mr. Simon (Mus. Genevae). Unspecified number of ♀.

One ♀ syntype. A ♀ specimen with labels: “603 30, Syrie, M^r Simon” [handwritten on ruled white card]; “Formicaleo laticollis Nav. Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Typus” [handwritten on pink card]. Specimen set with wings spread; about half of the left hind wing is lost. The abdomen is flattened dorsoventrally. Hölzel (1982: 264) refers to this specimen as the holotype, which may constitute a lectotype designation.

Distoleon laticollis (Navás, 1913)

nigriventris Navás, 1913c: 278 [*Nelees*].

Turkestan; Fergana, Dr Scobelev & Dr Weber-Bauler (Mus. Genevae). Unspecified series.

One ♀ syntype. One ♀ specimen with labels: “Turkestan oriental., Fergana, Alt., Dr Weber-Bauler” [printed on white paper]; “*Nelees nigriventris* Nav. Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Typus” [handwritten on pink card]. Specimens set with wings spread; the tip of the left antenna is missing. Since the type series was unspecified, this specimen should be regarded as a syntype.

Neuroleon nemausiensis nigriventris (Navás, 1913)

oculata Navás, 1926: 80 [*Neriga*].

Congo belga, Mus. de Ginebra. Unspecified number of ♀.

One ♀ syntype. A ♀ with labels: “Baudet, d’après lui à Brazzaville” [handwritten on white paper]; “*Neriga oculata* ♀ Nav. P. Navás S.J. det.” [handwritten on grey card with “P. Navás S.J. det.” printed]; “Typus” [handwritten on pink card]; “=*Stiphronera inclusa* (Wlk. 1853), det. W. Markl 1952” [handwritten on white card with “det. W. Markl” printed]. Specimen set with wings spread; the body is laterally compressed and the abdomen has been reattached with glue. *Stiphronera inclusa* is a species from Southeast Asia, and the locality label is therefore doubtful (Krivokhatsky, 1997).

A junior synonym of *Stiphronera inclusa* (Walker, 1853)

pardaloides Weele, 1907b: 257, pl. 9, fig. 5 [*Palpares*].

[Madagascar] Muséum Paris: Cote Ouest: entre Morondova et Mahabo, Grandidier; Moevarana, Bastard; Makaraingo, Escoffre. Musée de Genève: Majunga, Voeltzkow. Many specimens (both sexes).

One ♀ syntype. A ♀ specimen with labels: “Dr Voeltzkow, Orthoptera [sic], Majanga 12.5.90 Madagascar” [handwritten on white paper]; “19” [handwritten on a square of white card]; “*Palpares pardaloides* vdW typus det, v. d. Weele” [handwritten on white card with “det. v. d. Weele” printed]; “Syntypus” [printed on red paper]. Specimen set with wings spread; both antennae are missing. Saussure published accounts of the Orthoptera, Hymenoptera and Myriapoda collected by the Voeltzkow expedition, and this specimen was apparently sent to him in error.

Palpares pardaloides Weele, 1907

romieuxi Esben-Petersen, 1936: 201-202 [*Formicaleo*].

[Belgian Congo] Chinkolobwe. One ♀.

♀ holotype. A ♀ specimen with labels: “Ht Katanga, Chinkolobwe, 17-10-30, J. Romieux” [handwritten on white card with “Ht Katanga” and “J. Romieux” printed]; “*Formicaleo distinctus romieuxi* n.sp. det. Esben-Petersen” [handwritten on white card with “det. Esben-Petersen” and margin printed]; “TYPE” [printed on pink card]. Specimen set with wings spread; the right middle

and hind legs are lost. The abdomen is laterally flattened and has been repaired with glue.

Distoleon romieuxi (Esben-Petersen, 1936)

scolius strigatus Esben-Petersen, 1936: 200-201 [*Formicaleo*].

[Belgian Congo] Chinkolobwe. One damaged specimen. ♂ holotype. A ♂ specimen with labels: “Ht Katanga, Chinkolobwe, 27-10-30, J. Romieux” [handwritten on white card with “Ht Katanga” and “J. Romieux” printed]; “*Formicaleo scolius* var. *strigatus* n.v. det. Esben-Petersen” [handwritten on white card with “det. Esben-Petersen” and margin printed]; “TYPE” [printed on pink card]. Specimen set with wings spread; the left middle leg is missing and the right forewing lacks the tip. The abdomen is detached; it had been repaired with glue and a pin but is now in several pieces and has been glued to a card mount with its own label: “Holotypus F. scolia *strigatus* E.P., 1936?, Hollier 2016” [handwritten on red paper]. It is not clear why Esben-Petersen did not give the sex unless the abdomen reattached to the specimen was not part of the original.

A junior synonym of *Distoleon scolius* (Navas, 1914)

transvaalensis Navás, 1914: 638-639 [*Cueta*].

Transvaal, Junod Miss. (Mus. de Ginebra). One ♂.

♂ holotype. A ♂ specimen with labels: “Transvaal, Junod Miss^e, 624 25” [printed on pink paper]; “*Cueta transvaalensis* Nav. Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Typus” [handwritten on pink card]. Specimen set with wings spread; the last tarsal segment of the right middle leg is missing. Although the number on the data label has the same format as the MHNG acquisition register, the specimen does not correspond to the entry in the register. *Cueta transvaalensis* Navás, 1914

RAPHIDIOPTERA

balesdenti Poivre, 1991: 126-128 [*Subilla*].

Col de la Pousterle, Briançon, Hautes-Alpes. ♀ holotype and one ♀ paratype.

♀ holotype and one ♀ paratype. The ♀ holotype is partly mounted on two microscopic slides: (1) a slide with fragments of the antennae and the handwritten labels “Col de la Pousterle, VALLOUISE (H.-Alpes), août 1971 M. et Mme Balesdent” and “~~*Raphidia* (Subilla)~~ *balesdenti* n.sp. holotype ♀, antennes gche. MA 2”; (2) a slide with the left wings and the handwritten labels “Col de la Pousterle, VALLOUISE (H.-Alpes), août 1971 M. et Mme Balesdent” and “~~*Raphidia* (Subilla)~~ *balesdenti* n.sp. holotype ♀, ailes gauches, MA 2”. The rest of the specimen is in alcohol with labels: “*Subilla balesdenti* n. sp. holotype et paratype ♀♀, Dét. C. POIVRE, 1991. Ancien sous-genre élevé au rang de genre par Aspöck, 1986” [handwritten on white paper]; “Raphidies, col de la Pousterle, août 71” [handwritten on white

paper]; “*Raphidia flavipes* ♀♀ dét. B. Condé, 1971: leg. Mme Balesdent” [handwritten on white paper]; “*Raphidia (Subilla) balesdenti* n. sp. Col de la Pousterle, VALLOUISE (H.-Alpes), août 1971 M. et Mme Balesdent” [handwritten on white paper]; “*Raphidia (Subilla) balesdenti* n. sp. holotype” [handwritten on white paper]. The end of the abdomen is detached.

Parts of the ♀ paratype are mounted on three microscopic slides: (1) a slide with the wings and the handwritten labels “Col de la Pousterle, VALLOUISE (H^{tes}-Alpes), août 1971 M. et Mme Balesdent” and “*Raphidia (Subilla) balesdenti* n.sp. paratype ♀, ailes, MA 2”; (2) a slide with the legs and the handwritten labels “Col de la Pousterle, VALLOUISE (H.-Alpes), août 1971 M. et Mme Balesdent” and “*Raphidia (Subilla) balesdenti* n.sp. holotype [sic] ♀, P1, P2, P3 gche. MA 2”; (3) a slide with part of the seventh sternite and the handwritten labels “Col de la Pousterle, VALLOUISE (H.-Alpes), août 1971 M. et Mme Balesdent” and “*Raphidia (Subilla) balesdenti* n.sp. paratype ♀, 2 morceaux du 7^e sternite, MA 2”. The rest of the specimen is in alcohol in a second jar with labels: “*Subilla balesdenti* n. sp. holotype et paratype ♀♀, Dét. C. POIVRE, 1991. Ancien sous-genre élevé au rang de genre par Aspöck, 1986” [handwritten on white paper]; “Raphidies, col de la Pousterle, août 71” [handwritten on white paper]; “*Raphidia flavipes* ♀♀ dét. B. Condé, 1971: leg. Mme Balesdent” [handwritten on white paper]; “*Raphidia (Subilla) balesdenti* n. sp. Col de la Pousterle, VALLOUISE (H.-Alpes), août 1971 M. et Mme Balesdent” [handwritten on white paper]; “*Raphidia (Subilla) balesdenti* n. sp. paratype” [handwritten on white paper]. The head and the end of the abdomen are detached, and the left legs are missing (having been slide mounted).

A junior synonym of *Dichrostigma flavipes* (Stein, 1863)

laufferi Navas, 1915: 867-869, fig. 11 [*Raphidia*].

Escorial, leg. Lauffer. More than one ♂ and ♀.

One ♂ and one ♀, both probably paralectotypes. A ♂ specimen with labels: “Escorial, Lauffer” [printed on white card]; “*Raphidilla Laufferi* Nav. P. Navás S.J. det.” [handwritten on white card with “P. Navás S.J. det.” printed]; “Coll. gén., *Raphidia laufferi*” [typewritten on white card]; “*Raphidia (F.) laufferi* Nav., H. et. U. Aspöck det. 1972” [handwritten on white card with “H. et. U. Aspöck det. 19” printed]; “Paralectotypus” [printed on orange card]. Specimen set with wings spread; most of the left antennae is missing. The thorax has split where the pin is inserted and has been roughly repaired with glue.

A ♀ specimen with labels: “Escorial 1915, Lauffer” [handwritten on white card]; “*Raphidilla Laufferi* Nav. P. Navás S.J. det.” [handwritten on white card with “P. Navás S.J. det.” printed]; “Coll. gén., *Raphidia laufferi*” [typewritten on white card]; “*Raphidia (F.) laufferi* Nav., H. et. U. Aspöck det. 1972” [handwritten on white card with “H. et. U. Aspöck det. 19” printed]; “Paralectotypus”

[printed on orange card]. Specimen set with wings spread; most of the right antenna, the tibia and tarsi of the right front leg, the entire left front and both middle legs and the tarsi of the right hind leg are lost. The specimen is broken where the pin was inserted, and the metathorax, together with the hind wings and hind legs, and abdomen are glued to a card mount secured on the original pin.

The lectotype, designated by Aspöck *et al.* (1991: 325), is in the MCBS. The specimens in the MHNG are from the type locality and were collected by Lauffer, but it is impossible to say whether they formed part of the type series.

Harraphidia laufferi (Navás, 1915)

physodes Navás, 1913c: 281-282, fig. 9 [*Raphidia*].

Asia minor; Taurus, Col. Pictet (Mus. Genevae). Unspecified number of ♂.

One ♂ syntype. A ♂ specimen with labels: “620 48 Taurus, Asie min., Coll. Pictet” [handwritten on ruled white card with “Coll. Pictet” printed]; “*Raphidia physodes* ♂ Nav., Navás S.J. det.” [handwritten on white card with “Navás S.J. det.” printed]; “Typus” [handwritten on pink card]; “Coll. gén., *Raphidia physodes*” [typewritten on white card]; “Holotypus *Raphidia physodes* NAVAS, 1914 [sic] H. et U. Aspöck vid. 1972” [handwritten on red card]. Specimen set with wings spread; both antennae are lost. The specimen has split where the pin was inserted; the head, prothorax and front legs and mesothorax, middle legs and front wings are still on the pin, while the rest of the specimen is in a glass tube secured through the cork stopper on the original pin. The type series was unspecified; Aspöck *et al.* (1991) refer to this specimen as the holotype without justification which may constitute a lectotype designation.

Subilla physodes (Navás, 1913)

The MHNG collection may contain syntypes of *Sialis fuliginosus* Pictet, 1836 but the specimens from Pictet’s collection have been relabelled and it is impossible to positively identify any specimens as syntypes (Pictet illustrated adults of both sexes and larvae) as part of the type series. McLachlan (1880: 63-64) gave the name *Chrysopa lineolata* to three specimens (sex unspecified) from “Grenade” and “Eaux-Bonnes, Pyrénées” which Pictet (1865: 68) had identified as *C. clathrata* Schneider, 1845 and redescribed. No specimens identifiable as these syntypes could be located in the MHNG collection [*C. lineolata* is a junior synonym of *Pseudomallada flavifrons* (Brauer, 1851)].

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A new species of *Lycodon* Boie, 1826 (Serpentes: Colubridae) from central Laos

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Abstract: We describe a new species of the genus *Lycodon* Boie based on an adult male specimen from Khammouane Province, central Laos. *Lycodon banksi* **sp. nov.** is distinguished from its congeners by a combination of the following characters: (1) dorsal scales in 17-17-15 rows, dorsal scales on the anterior 2/3 of the body length smooth, the six central dorsal scale rows of the posterior 1/3 of the body length feebly keeled; (2) supralabials 8; (3) infralabials 10; (4) loreal in contact with the eye; (5) cloacal single; (6) ventral scales 241; (7) dorsal surface of body with 87 greyish yellow blotches; (8) ventral surface of body and tail uniformly grey cream. Based on the molecular comparison, *Lycodon banksi* **sp. nov.** is placed in a clade with other species previously considered to be members of the genus *Dinodon*. The new species is at least 9% genetically divergent from other species within this clade as shown by a fragment of the mitochondrial cytochrome *b*. This discovery increases the number of *Lycodon* species known from Laos to eleven.

Keywords: New species - *Lycodon* - Laos - karst forest - morphology - phylogeny - taxonomy.

INTRODUCTION

The genus *Lycodon* Boie is one of the most diverse genera of colubrid snakes, with 50 currently recognized species (Uetz *et al.*, 2017). The members of this genus have a broad distribution from eastern Iran to southern China and Japan, southward to the Philippines as well as the Indo-Australian Archipelago (Lanza, 1999; Siler *et al.*, 2013; Neang *et al.*, 2014). Six species of *Lycodon* have been described within the last five years, namely *Lycodon synaptor* Vogel & David, 2010, *L. gongshan* Vogel & Luo, 2011, and *L. liuchengchaoi* Zhang, Jiang, Vogel & Rao, 2011 from China; *L. davidi* Vogel, Nguyen,

Kingsada & Ziegler, 2012 from Laos; *L. zoosvictoriae* Neang, Hartmann, Hun, Souter & Furey, 2014 from Cambodia; and *L. cavernicolus* Grismer, Quah, Anuar, Muin, Wood & Nor, 2014 from Malaysia.

From Laos, ten species of *Lycodon* have been reported to date, comprising *L. capucinus* (Boie, 1827), *L. davidi* Vogel, Nguyen, Kingsada & Ziegler, 2012, *L. fasciatus* (Anderson, 1879), *L. futsingensis* (Pope, 1928), *L. laoensis* Günther, 1864, *L. meridionalis* (Bourret, 1935), *L. rufozonatus* Cantor, 1842, *L. ruhstrati abditus* Vogel, David, Pauwels, Sumontha, Norval, Hendrix, Vu & Ziegler, 2009, *L. septentrionalis* Günther, 1875, and

L. subcinctus Boie, 1827 (Deuve, 1970; Vogel *et al.*, 2012; Siler *et al.*, 2013; Luu *et al.*, 2013; Teynié *et al.*, 2014).

Our recent field survey in the karst forest of Phou Hin Poun National Protected Area (NPA), Khammouane Province, central Laos led to the discovery of a snake, which could be identified as a member of the genus *Lycodon* based on the following characters: eye with a vertically elliptical pupil; nostril enlarged; robustly arched upper maxillary bone with an inward curve in the anterior part; anterior and posterior maxillary teeth interrupted by a diastema; dorsal scales smooth or weakly keeled, in 17 rows anteriorly and at midbody, and 15 rows posteriorly; ventral scales weakly notched (Lanza 1999; Grismer *et al.*, 2014). Although only a single specimen was collected, it proved to be morphologically distinct. Our finding is corroborated by another record, a closely resembling specimen photographed in about 12.4 km distance. The morphological results are further supported by molecular analyses so that we describe the single adult male from Phou Hin Poun, Khammouane Province, central Laos as a new *Lycodon* species.

MATERIAL AND METHODS

Sampling: The field survey was conducted by Vinh Quang Luu and Thomas Calame in Phou Hin Poun NPA, Khammouane Province, central Laos in April 2016. The collected specimen was fixed in approximately 85% ethanol, and subsequently transferred to 70% ethanol for permanent storage. Liver tissue sample was preserved separately in 95% ethanol. The specimen from Phou Hin Poun NPA, central Laos was deposited in the collections of the Vietnam National University of Forestry (VNUF), Hanoi, Vietnam. Another specimen was photographed on 22 July 2016 by an arachnology team led by Peter Jaeger, in ca. 12.4 km distance from the type locality.

Morphological analysis: Measurements were taken following Vogel *et al.* (2009) with a digital caliper to the nearest 0.1 mm, except body and tail lengths. These measurements included: head length (HL, from snout tip to jaw angles); head width (HW, maximum head width at posterior margin of parietals); head height (HH, vertical height between upper and under sides of head were measured at HW); interorbital distance (IO, the distance between outer edges of supraoculars); eye-nostril distance (EN, from anterior edge of the orbit to posterior edge of nostril); internarial distance (IN, horizontal diameter between nostrils); eye diameter (ED, horizontal diameter of the orbit); snout length (SnL, from the tip of rostral to the anterior edge of the orbit); snout-vent length (SVL, from tip of snout to the vent); tail length (TaL); ratio of tail length / total length (TaL/TL); total length (TL).

Scale counts were taken following Vogel *et al.* (2009).

Ventral scales (VEN) were counted according to Dowling (1951); dorsal scale rows (DSR): number of dorsal scale rows at neck (ASR, at one head length behind head), number of dorsal scales at midbody (MSR), and number of dorsal scale rows before the vent (PSR, at one head length before the vent); supralabials (SL, counted on upper lips); infralabials (IL, counted on lower lips); loreals (Lor); loreal scale touching the orbit (yes or no); preoculars (PreOc); postoculars (PosOc); temporals (Temp, counted immediately behind postoculars and between posterior SL and parietals). Bilateral scale counts were given as left/right. Keel (keeled dorsal scale rows); PreVEN (preventral scales); VEN notched (present or absent); VEN keeled (present or absent); SC (subcaudal scales); numbers of pattern-units (like crossbars or vertebral blotches) are provided as number on body + number on tail.

For comparisons, we referred to the data provided by Boulenger (1893), Smith (1943), Orlov & Ryabov (2004), Neang *et al.* (2014), and Grismer *et al.* (2014); studied specimens are listed in the Appendix.

Museum abbreviations are as follows: CAS-California Academy of Sciences; GP-Specimens in the collection of Peng Guo; LSUMZ-The Louisiana State University Museum of Natural Science; MNHN-Muséum National d'Histoire Naturelle, Paris, France; VNUF-Vietnam National University of Forestry.

Molecular data and phylogenetic analyses: The mitochondrial cytochrome *b* gene was employed in this study, because it has been widely used in previous molecular analyses of *Lycodon* (e.g., Guo *et al.*, 2013, Siler *et al.*, 2013). We included six new sequences from samples collected in Laos and Vietnam (Table 1). Other sequences of related species were obtained from GenBank. Three species, *Ahaetulla prasina*, *Boiga cynodon*, and *Dispholidus typus*, were assigned as outgroups based on their phylogenetic relationships to the genus *Lycodon* (Guo *et al.*, 2013, Siler *et al.*, 2013) (Table 1).

We used the protocols of Le *et al.* (2006) for DNA extraction, amplification, and sequencing. A fragment of the mitochondrial cytochrome *b* was amplified using the primer pair L14910/H16064 (Burbrink *et al.*, 2000). After sequences were aligned by Clustal X v2 (Thompson *et al.*, 1997), data were analyzed using maximum parsimony (MP) and maximum likelihood (ML) as implemented in PAUP*4.0b10 (Swofford, 2001) and Bayesian analysis (BA) as implemented in MrBayes v3.2 (Ronquist *et al.*, 2012). Settings for these analyses followed Le *et al.* (2006), except that the number of generations in the Bayesian analysis was increased to 1×10^7 and the number of bootstrap replicates in ML to 1000. The optimal model for nucleotide evolution was set to TrN+I+G for ML and combined Bayesian analyses as selected by Modeltest v3.7 (Posada & Crandall, 1998). The cutoff point for the burn-in function was set to 19 in

the Bayesian analysis, as -lnL scores reached stationarity after 19,000 generations in both runs. Nodal support was evaluated using Bootstrap replication (BP) as estimated in PAUP and posterior probability (PP) in MrBayes v3.2. BP ≥ 70% and PP ≥ 95% are regarded as strong support for a clade. Uncorrected pairwise divergences were calculated in PAUP*4.0b10 (Table 2).

RESULTS

Molecular data, Phylogenetic analysis: The final matrix consisted of 1100 aligned characters, of which 440 were parsimony informative. The alignment did not contain gaps. Maximum parsimony analysis of the dataset recovered two most parsimonious trees with

Table 1. *Lycodon* samples used in the molecular analyses (for abbreviations see Material and methods); * = listed as *L. aulicus* in Siler *et al.* (2013); ** = listed as *L. fasciatus* in genbank but as *L. cf. fasciatus* in the CAS catalogue.

Species	GenBank no.	Locality	Voucher number
<i>Ahaetulla fronticinta</i>	AF471072	Myanmar: Ayeyarwady Division	CAS 204966
<i>Ahaetulla prasina</i>	KC010339	Philippines: Palawan Province	KU 326673
<i>Boiga cynodon</i>	KC010340	Philippines: Negros Occidental Province	KU:324614
<i>Dispholidus typus</i>	AY188012	Not reported	Not reported
<i>Lycodon capucinus</i> *	KC010350	Philippines: Romblon Province	KU:315378
<i>L. capucinus</i> *	MH669273	Laos: Bolikhamxay Province	VNUF R.2015.15
<i>L. butleri</i>	KJ607892	Malaysia: Perak	LSUHC:8365
<i>L. butleri</i>	KJ607891	Malaysia: Perak	LSUHC:9137
<i>Lycodon banksi</i> sp. nov.	MH669272	Laos: Khammouane Province	VNUF R.2015.20
<i>L.cf. fasciatus</i> **	KC010366	Myanmar: Chin State	CAS 234957
<i>L.cf. fasciatus</i> **	KC010365	Myanmar: Chin State	CAS 234875
<i>L. futsingensis</i>	KC733206	China: Zhejiang Province	GP 2216
<i>L. futsingensis</i>	KC733207	China: Guangdong Province	GP 2226
<i>L. ‘flavozonatus’</i>	KC733199	China: Guangxi Province	GP1939
<i>L. ‘flavozonatus’</i>	KC733210	China: Guangdong Province	GP2279
<i>L. laoensis</i>	KC010368	Laos: Salavan Province	FMNH 258659
<i>L. laoensis</i>	KC010370	Cambodia: Pursat Province	LSUHC 8481
<i>L. meridionalis</i>	MH669271	Vietnam: Bac Kan Province	VNUF R.2012.4
<i>L. meridionalis</i>	MH669268	Vietnam: Ninh Binh Province	VNUF R.2017.54
<i>L. meridionalis</i>	MH669269	Vietnam: Ninh Binh Province	VNUF R.2017.88
<i>L. meridionalis</i>	MH669270	Vietnam: Thanh Hoa Province	VNUF R.2017.123
<i>L. rufozonatus</i>	KC733194	China: Sichuan Province	GP 133
<i>L. rufozonatus</i>	AF471063	Not reported	LSUMZ:44977
<i>L. ruhstrati</i>	KC733208	China: Guangdong	GP2243
<i>L. ruhstrati</i>	KC733200	China: Guangdong	GP2249
<i>L. semicarinatus</i>	AB008539	Not reported	Not reported
<i>L. subcinctus</i>	KC010385	Philippines: Palawan Province	KU 309447
<i>L. subcinctus</i>	KC010384	Philippines: Palawan Province	KU 327571
<i>L. subcinctus</i>	KC733203	China	GP2191
<i>L. synaptor</i>	KC733204	China: Yunnan Province	GP 2188

Table 2. Uncorrected (“p”) distance matrix showing percentage pairwise genetic divergence (cytochrome *b*) between new and closely related species.

Species name	1	2	3	4	5
1. <i>Lycodon banksi</i> sp. nov.	-				
2. <i>L. meridionale</i> & <i>L. ‘flavozonatus’</i>	9.0-9.2	-			
3. <i>L. futsingensis</i>	9.6	8.5-8.7	-		
4. <i>L. rufozonatus</i>	10.6-11.1	7.4-8.2	8.7-9.2	-	
5. <i>L. semicarinatus</i>	10.9	9.8-10.3	10.3	9.3-10.2	-

1649 steps (CI = 0.46; RI = 0.65). In the ML analysis, the score of the single best tree found was 8329.12 after 2678 arrangements were tried. The topology derived from the Bayesian analysis (Fig. 1) was similar to that in Guo *et al.* (2013), but nodes of the phylogeny received lower statistical support. The new species was recovered in a clade together with other species, which were previously placed in the genus *Dinodon* (see Siler *et al.*, 2013; Guo *et al.*, 2013). This clade was strongly supported by both MP and Bayesian analyses (BP = 86%, PP = 97%) (Fig. 1). The new species is most closely related to a clade containing '*L. flavozonatus*', *L. futsingensis*, *L. meridionalis* in terms of genetic distance based on cytochrome *b*, and is diverged at least about 9.0-9.2% from the latter species (Table 2).

TAXONOMIC ACCOUNT

Lycodon banksi sp. nov.

Figs 2-5, Table 3

Holotype: VNUF R.2015.20 (field number: TK 20.15), adult male, collected on 4 April 2015 by Vinh Quang Luu and Thomas Calame in the karst forest, at the mouth of a cave, Phou Hin Poun NPA, Hinboun District, Khammouane Province, central Laos, at an elevation of 167 m a.s.l.

Diagnosis: *Lycodon banksi* sp. nov. is characterized by the following morphological characters: (1) dorsal scales in 17-17-15 rows, dorsal scales on the anterior 2/3 of the body length smooth, the six central dorsal scale rows of the posterior 1/3 of the body length feebly keeled; (2) supralabials 8; (3) infralabials 10; (4) loreal entering orbit; (5) cloacal single; (6) ventral scales 241; (7) dorsal surface of body with 87 greyish yellow blotches; (8) ventral surface of body and tail uniformly grey cream.

Description of the holotype: Head elongate (HL 15.3 mm), moderately distinct from the neck, longer than wide (HW/HL ratio 0.71), depressed (HH/HL ratio 0.40), narrow anteriorly (IN/IO ratio 0.65); snout elongate (SnL/HL ratio 0.39); nostril lateral, oval shaped, located in the middle of the nasal; eye large (ED/HL ratio 0.17), pupils vertically elliptic; rostral triangular, much broader than high, hardly visible from above; nasal divided into two scales by a vertical ridge along posterior edge of nostril; two square internasals, as wide as long, bordered by two large, subpentagonal prefrontals posteriorly; frontal single, enlarged, pentagonal, narrowed posteriorly; parietals longer than wide, in contact with each other medially, with upper anterior and posterior temporals, paraparietal laterally and four nuchal scales posteriorly; loreal 1/1, elongate, entering orbit; supralabials 8/8, first and second in contact with nasal, third to fifth entering orbit, sixth largest; infralabials 10/10, first pair

in broad contact with each other, first to fifth in contact with first pair of chin shields; first and second pairs of chin shields elongate, of the same size and shape, separated by a medial groove, first pair larger than the second; preocular 1/1; postoculars 2/2, of the same size, bordering anterior temporals; anterior temporals 2/2, posterior temporals 3/3, upper ones smaller than lower ones.

Body elongate, SVL 415 mm; TaL >50 mm (tail tip lost); preventrals 2, ventrals 241; subcaudals 26 (tail tip lost), divided, weakly notched laterally; cloacal single; DSR 17-17-15; dorsal scales on the anterior 2/3 of the body length smooth, the six central dorsal scale rows of the posterior 1/3 of the body length feebly keeled; the vertebral scales not enlarged.

Colouration in life: Head dark grey, without vertical light nuchal band; dorsal surface of body dark grey-yellow with 87 greyish yellow irregular dorsal blotches; first body blotch starting at ventral scale 13, a half vertebral scale covered by this blotch; two yellow stripes on each side, from behind the neck to vent, indistinct posteriorly; ventral scales grey cream; dorsal surface of tail with at least eleven greyish yellow tail blotches, ventral surface of tail grey cream.

Hemipenis: The left hemipenis is only in part everted but shows a spinose ornamentation.

Additional specimen: One specimen which was not collected but detected and photographed on 22 July 2016 by an arachnology team consisting of Peter Jaeger, Aloke Sahu and Jonas Ewert, in Khammouane Province, in ca. 12.4 km distance from the type locality. The color pattern of this specimen resembles closely that of the holotype.

Comparisons: In our phylogenetic analysis, *Lycodon banksi* sp. nov. is nested in a clade containing *L. rufozonatus*, *L. semicarinatus* (Cope), '*L. flavozonatus*', *L. futsingensis* and *L. meridionalis*. The new species differs from the similar *L. meridionalis* by having loreal entering the orbit (*versus* separated from the orbit), dorsal scales on the anterior 2/3 of the body length smooth, the six central dorsal scale rows on the posterior body third feebly keeled (*versus* distinctly keeled), dorsal head pattern uniform dark grey (*versus* with yellow-black marbling in *L. meridionalis*), and ventral surface grey cream (*versus* yellow with dark spots posteriorly) (see Bourret, 1935; Orlov & Ryabov, 2004); from *L. rufozonatus* by having loreal entering the orbit (*versus* usually separated), a distinctly higher ventral scale count (241 *versus* 185-204), dorsal scales feebly keeled in the posterior body part (*versus* all smooth), dorsal head pattern uniform dark grey (*versus* dark brown with yellow borders), and body pattern blotched (*versus* banded) (Boulenger 1893); from *L. semicarinatus* by having loreal touching the orbit (*versus* separated), a higher ventral scale count

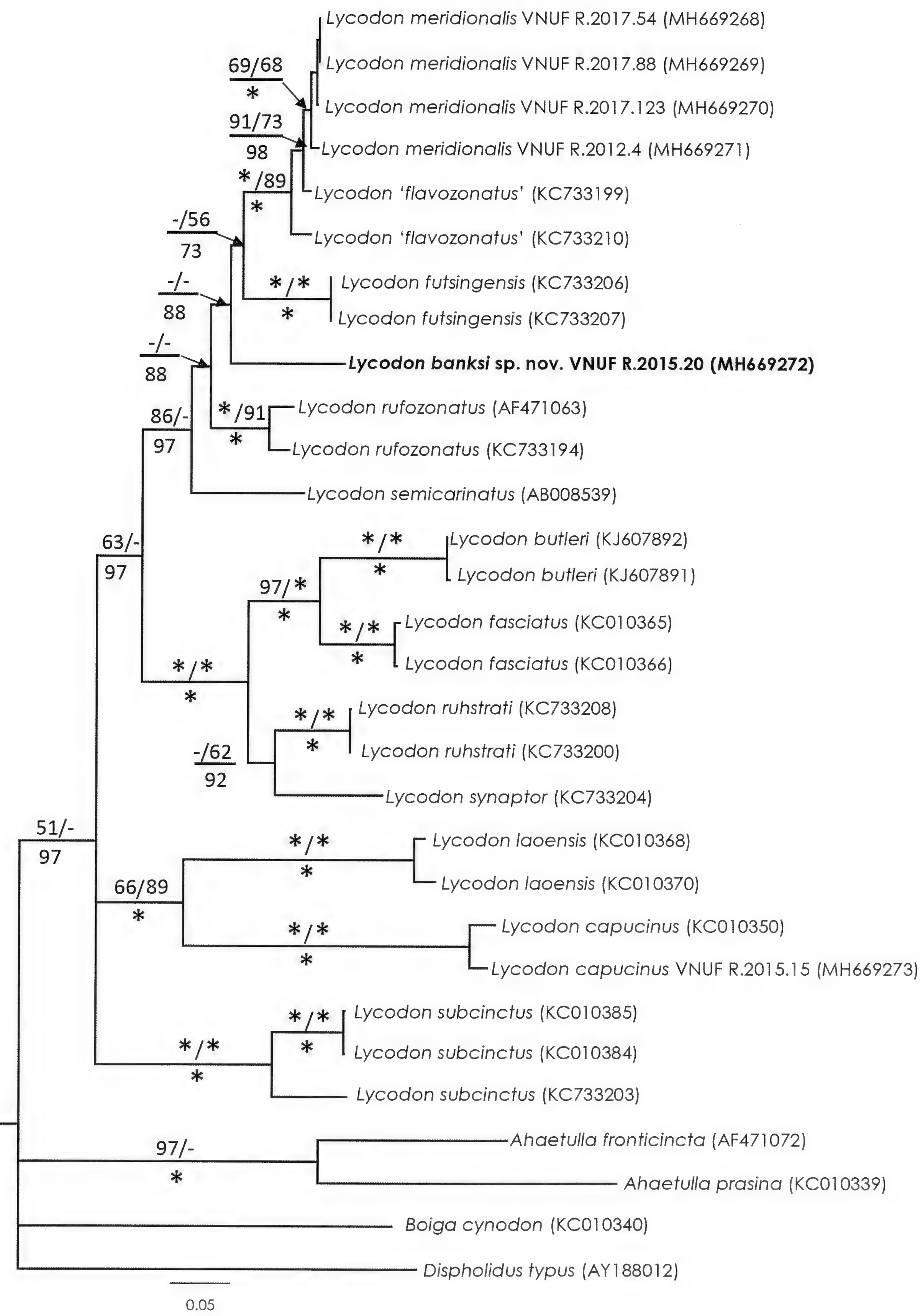


Fig. 1. Bayesian cladogram based on the partial cytochrome *b* gene. Numbers above and below branches are bootstrap values of MP/ML analyses (>50%) and Bayesian posterior probabilities, respectively. Asterisk denotes 100% value.

Table 3. Measurements (in mm) and morphological characters of the holotype of *Lycodon banksi* **sp. nov.** (measurements in mm; for other abbreviations see material and methods; * tail tip lost).

Character	<i>Lycodon banksi</i> sp. nov. VNUF R.2015.20
Sex	Male
SVL	415.0
TaL	50.0*
TL	465.0
HL	15.3
HW	10.8
HH	6.1
IO	6.3
EN	3.3
IN	4.1
ED	2.6
SnL	6.0
DSR	
ASR	17
MSR	17
PSR	15
Keeling	6 dorsal scale rows on the posterior body third feebly keeled
VEN	241
PrVEN	2
Ventral notched	Yes
Ventral keeled	No
SC	26*
divided	Yes
Cloacal	Single
Loreal	1/1
Loreal entering orbit	Yes
SL	8/8
entering orbit	3,4,5
largest SL	6/6
IL	10/10
IL in contact with 1st chin shield	1–5
PreOc	1/1
PostOc	2/2
Temporal scales	
anterior	2/2
posterior	3/3
Scales around paraparietal	5/7
Scales between parietals	4
Nuchal band	Absent
Body blotches	87 (yellow blotches)
Tail blotches	15*
Belly pattern	uniform grey cream
Ventral tail pattern	grey cream
First body blotch position (at VEN)	13
First blotch width (vertebral scales)	0.5

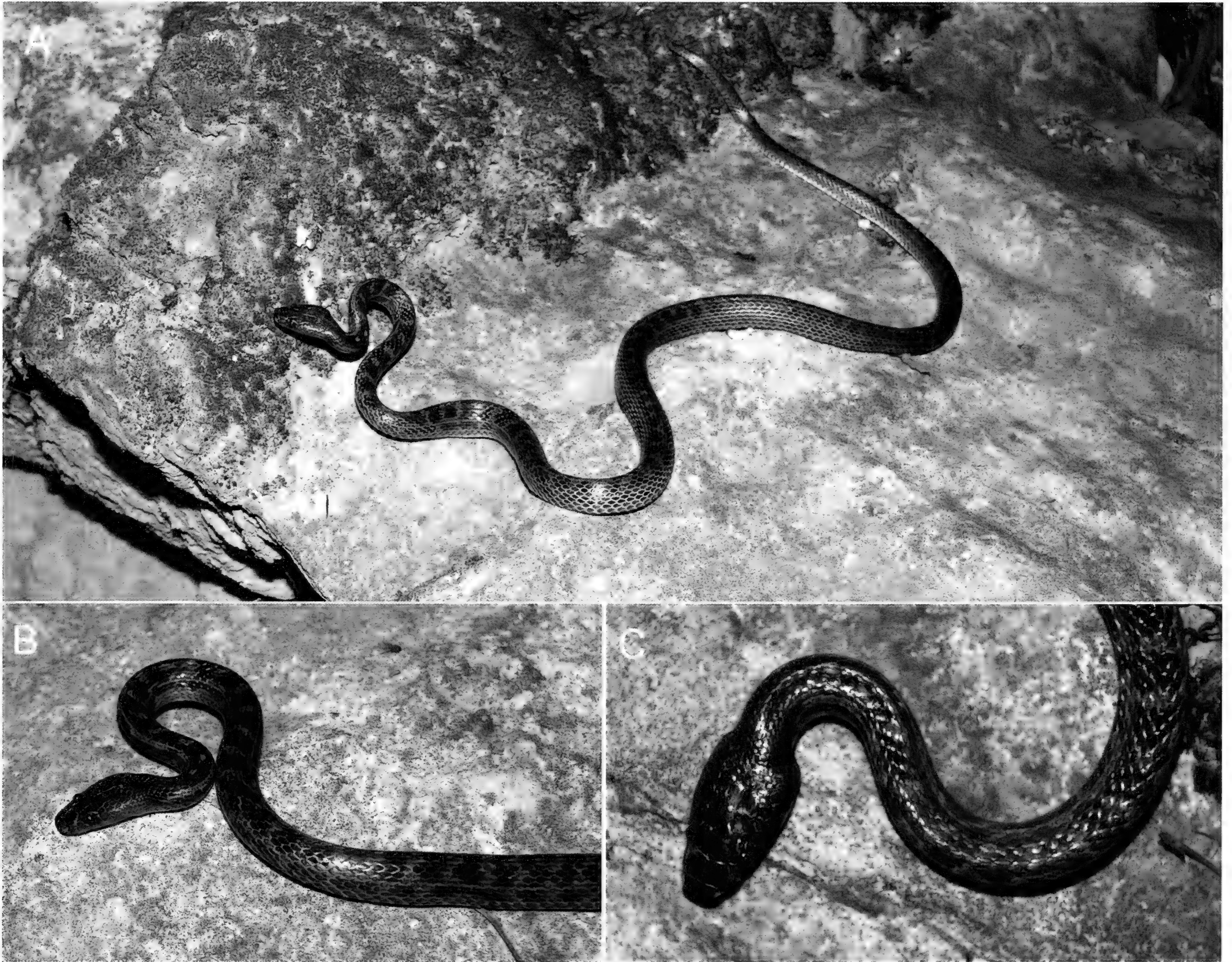


Fig. 2. Adult male holotype of *Lycodon banksi* **sp. nov.** (VNUF R.2015.20) in life. (A) dorsolateral view. (B) Head in dorsolateral view. (C) Head in dorsal view. Photos: V. Q. Luu.

(241 *versus* 211-234), dorsal scale rows keeled along posterior 1/3 (*versus* keeled along anterior half), belly pattern uniform grey cream (*versus* yellow), and body pattern blotched (*versus* banded) (Boulenger 1893); from *L. flavozonatus* by having loreal in contact with the orbit (*versus* separated), cloacal single (*versus* divided), six dorsal scale rows on the posterior third of the body feebly keeled (*versus* 10-12 keeled dorsal scale rows at midbody), dorsal head dark grey (*versus* black with light markings), and belly pattern uniform grey cream (*versus* yellow with large black spots); from *L. futsingensis* by having loreal entering the orbit (*versus* separated), a higher ventral scale count (241 *versus* 193-203 in males), dorsal scales feebly keeled in the posterior body part (*versus* all smooth), and body pattern blotched (*versus* banded) (Vogel *et al.*, 2012; Neang *et al.*, 2014) (Table 4).

The new species has a loreal entering the orbit and thus differs from the following species and subspecies of the *Lycodon ruhstrati* group which have the loreal separated

from the orbit: *L. cardamomensis* Daltry & Wüster, 2002, *L. davidi*, *L. multifasciatus* (Maki, 1931), *L. ophiophagus* Vogel, David, Pauwels, Sumontha, Norval, Hendrix, Vu & Ziegler, 2009, *L. paucifasciatus* Rendahl in Smith, 1943, *L. ruhstrati ruhstrati* (Fischer, 1886), and *Lycodon ruhstrati abditus* (Vogel *et al.*, 2009). In addition, the new species differs from *L. cardamomensis* by having more ventral scales (241 *versus* 215), and in body pattern (87 blotches *versus* 12 bands); from *L. davidi* by having more ventral scales (241 *versus* 224), six dorsal scale rows on the posterior third of the body feebly keeled (*versus* dorsal scale rows at midbody slightly keeled, outermost rows entirely smooth throughout body), and belly pattern uniform grey cream (*versus* anterior third whitish-cream, posterior part heavily speckled with dark dots); from *L. multifasciatus* by having more ventral scales (241 *versus* maximum 237), and dorsal pattern blotched (*versus* banded); from *L. ophiophagus* by having more ventral scales (241 *versus* 211), and dorsal pattern (87 blotches *versus* 21-22 bands); from *L. paucifasciatus*



Fig. 3. Different head views of the adult male holotype of *Lycodon banksi* **sp. nov.** (VNUF R.2015.20). Photos V. Q. Luu.

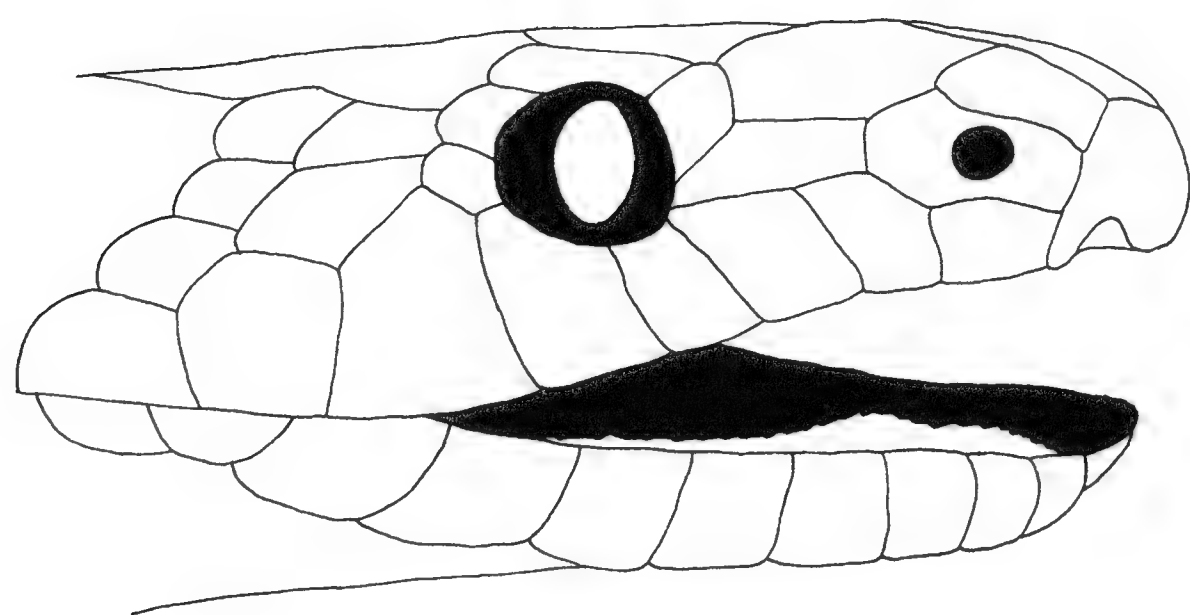


Fig. 4. Lateral head view of the adult male holotype of *Lycodon banksi* **sp. nov.** (VNUF R.2015.20). Drawing by T. Ziegler.

by having fewer dorsal scale rows at neck (17 *versus* 19), more ventral scale rows (241 *versus* 221-222), six dorsal scale rows on the posterior third of the body feebly keeled (*versus* two upper rows plus vertebral row distinctly keeled), and dorsal pattern blotched (*versus* banded) (Neang *et al.*, 2014); from *L. r. ruhstrati* and *Lycodon ruhstrati abditus* by having more ventral scales (241 *versus* 211-228; 241 *versus* 206-224, respectively), and dorsal pattern blotched (*versus* banded in the latter) (Vogel *et al.*, 2012); from *L. synaptor* by having much more ventral scale rows (241 *versus* 201-203), dorsal pattern with 87 blotches (*versus* 30-31 bands), and belly pattern uniform grey cream (*versus* banded) (Vogel & David 2010); from *L. zoosvictoriae* by having more

ventral scales (241 *versus* 213), dorsal pattern consisting of 87 blotches (*versus* 31), and having six dorsal scale rows on the posterior third of the body feebly keeled (*versus* all weakly keeled) (Neang *et al.*, 2014).

From the remaining species occurring in Laos, the new species can be distinguished as follows: from *L. capucinus* by having more ventrals (241 *versus* 182-211), fewer supralabials (8/8 *versus* 9-10), cloacal single (*versus* divided), dorsal blotches 87 (*versus* reticulated), and greyish yellow blotched body pattern (*versus* reticulated); from *L. fasciatus* by having more ventral scale rows (241 *versus* 182-225), dorsal pattern consisting of 87 blotches (*versus* 19-49 bands), and belly pattern uniform grey cream (*versus* white with dark blotches) (Neang *et al.*, 2014); from *L. laoensis* by having loreal in contact with the orbit (*versus* separated), more ventrals (241 *versus* 169-192), and dorsal scales feebly keeled in the posterior body part (*versus* all smooth) (Neang *et al.*, 2014); from *L. septentrionalis* by having more infralabials (10 *versus* 7-8), more ventral scales (241 *versus* 202-217), and dorsal pattern blotched (*versus* banded), as well as belly pattern uniform grey cream (*versus* white) (Neang *et al.*, 2014); from *L. subcinctus* by the presence of preocular scale (*versus* absent), having cloacal scale single (*versus* divided), dorsal pattern blotched (*versus* banded in anterior part), and more ventral scale rows (241 *versus* 129-230) (Neang *et al.*, 2014).

From the remaining species in the *fasciatus* group, the new species differs as follows: from *L. butleri* Boulenger by having more ventral scale rows (241 *versus* 220-227), dorsal pattern blotched (*versus* banded), and belly pattern

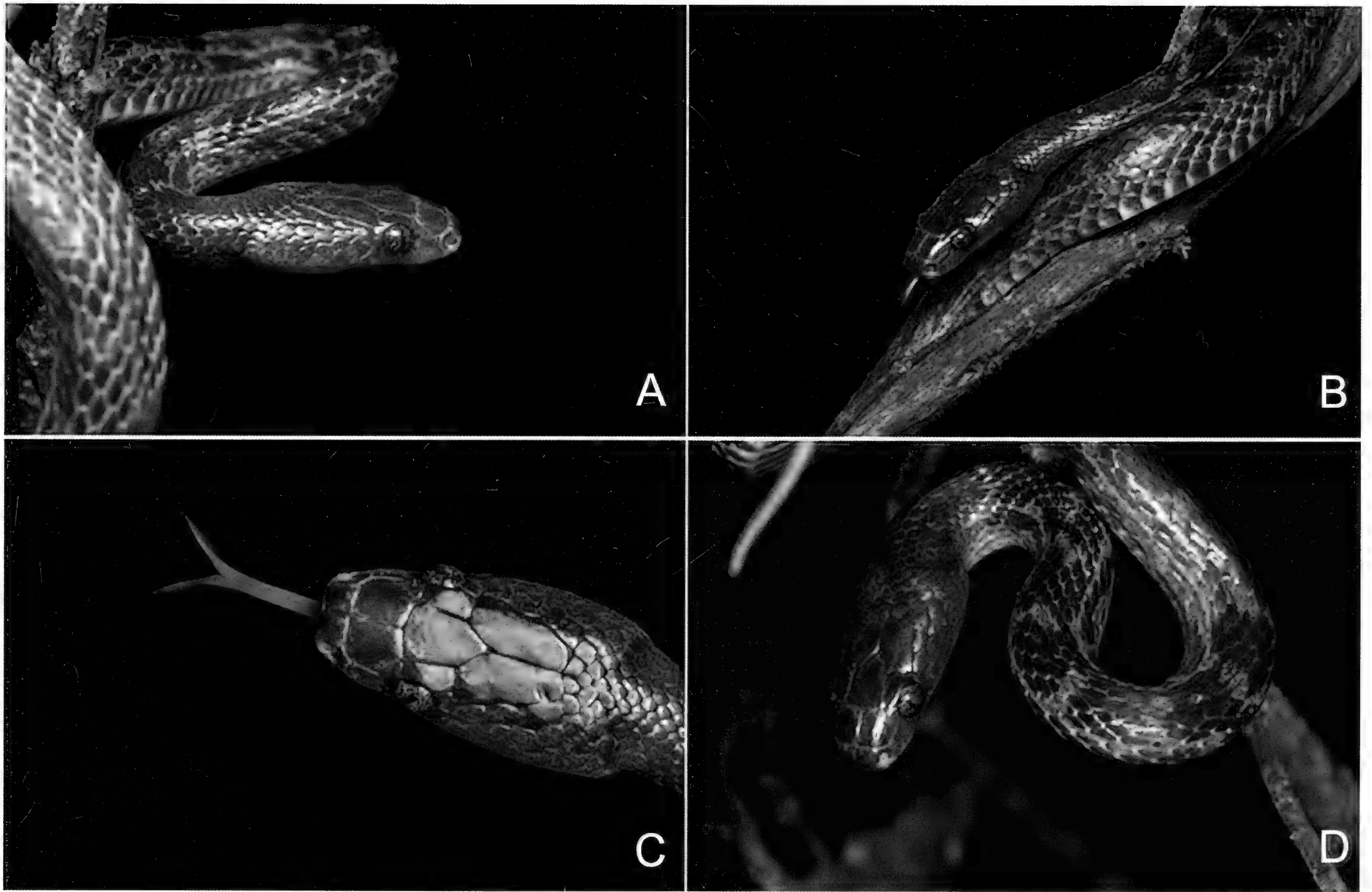


Fig. 5. Additional record of *Lycodon banksi* **sp. nov.** in life: (A- B) dorsolateral views. (C) Head in dorsal view. Photos A-C A. Sahu. (D) Dorsal view. Photo P. Jaeger.

uniform grey cream (*versus* banded & spotted) (Grismer *et al.*, 2014); from *L. cavernicolus* by having dorsal head uniformly dark grey (*versus* light brown), fewer supralabials (8 *versus* 9 or 10), more dorsal blotches (87 *versus* 36-45 bands), dorsal scales on the anterior 2/3 of the body length smooth, the six central dorsal scale rows of the posterior 1/3 of the body length feebly keeled (*versus* all keeled), and greyish yellow blotched pattern on the body (*versus* white bands); from *L. gongshan* by having six dorsal scale rows on the posterior third of the body feebly keeled (*versus* upper and vertebral dorsal rows keeled), more ventral scale rows (241 *versus* 210-216), and dorsal pattern with 87 blotches (*versus* 32-40 bands) (Vogel & Luo, 2011); from *L. liuchengchaoi* by having cloacal scale single (*versus* divided), dorsal pattern consisting of 87 irregular greyish yellow dorsal blotches (*versus* 40 well-defined yellow rings), and more ventral scales (241 *versus* 204) (Zhang *et al.*, 2011).

Distribution: *Lycodon banksi* **sp. nov.** is currently known only from the type locality in the Phou Hin Poun NPA, Khammouane Province, central Laos (Fig. 6).

Etymology: The name of the species is dedicated to our friend and colleague Chris Banks, International Coordinator, Philippine Crocodile National Recovery

Team, Zoos Victoria, Australia, for his outstanding contributions towards amphibian and reptile conservation, in particular of the Philippine Crocodile. We propose the following common names: Banks' Wolf Snake (English), Banks Wolfszahnatter (German).

Natural history: The holotype was found at 20:39 h, crawling on a limestone outcrop in the karst forest, approximately 0.3 m above the forest floor, at an elevation of 167 m a.s.l. The humidity at the time of collection was approximately 85% and the air temperature ranged from 23 to 26°C (Fig. 7). Another specimen was observed 12.4 km away from the type locality, active on the ground at 23:30 h, near a limestone cliff in the secondary forest.

DISCUSSION

In our phylogenetic analyses, *Lycodon banksi* is placed in a clade with other species previously considered to be members of the genus *Dinodon*. In addition, the specimen of *L. meridionalis* from Bac Kan Province, Vietnam was nested in the same clade with '*L. flavozonatus*' from Guangdong and Guangxi provinces in southern China. The genetic distance between the Vietnamese and Chinese

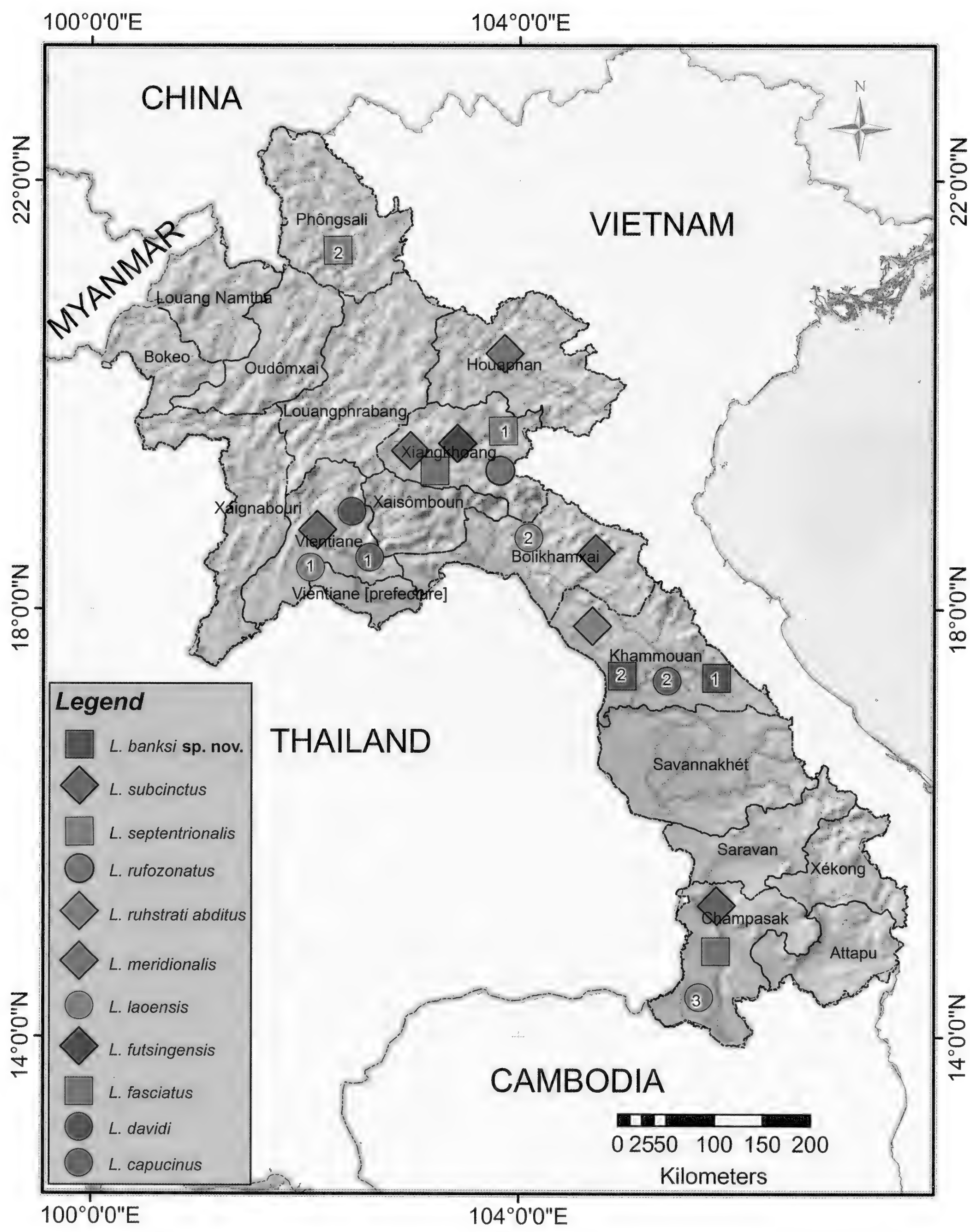


Fig. 6. Map showing the type locality of *Lycodon banksi* sp. nov. in Khammouane Province (black dots) and other records of the genus *Lycodon* occurring in Laos (after Deuve, 1970; Vogel *et al.*, 2012; Siler *et al.*, 2013; Luu *et al.*, 2013; Teynié *et al.*, 2014).

samples is approximately 1.4-2.4% (2.6% between two Chinese samples). Morphological features of the specimens from Bac Kan, Ninh Binh, and Thanh Hoa provinces were consistent with those in the descriptions of *L. meridionalis* by Bourret (1935) and Orlov & Ryabov (2004) in the following characters: snout-vent length in males reaching 1295 mm; dorsal head with yellow-black marble markings; transverse bands on body 86-115; ventral scales 234-245; cloacal plate single; belly pattern

uniform yellow with dark spots posteriorly (Table 4). Therefore, based on the molecular data, we herein initially assign two specimens (*'L. flavozonatus'* GP 1939, 2279) from China to *L. meridionalis*, although this placement needs to be confirmed by further morphological studies. Superficially, the new species is similar to *L. meridionalis* in dorsal pattern. However, they are clearly distinguishable in other morphological features, e.g., dorsal scalation, dorsal head, and belly patterns. Although the new species



Fig. 7. Habitat of *Lycodon banksi* **sp. nov.** at the type locality. Photo V. Q. Luu.

has no clear sister species according to the phylogenetic analyses, it is most closely related to *L. meridionalis* in terms of genetic distance, but distinctly differing from the latter (ca. 9%).

The new species seems to be a nocturnal and terrestrial snake, and rare. It is a karst-dweller in the northern Truong Son Range, as are *L. davidi* and *L. ruhstrati abditus* (Vogel *et al.*, 2012; Luu *et al.*, 2013). *L. banksi* has a unique pattern of dark grey and yellow colouration on its dorsal surface, which offers a perfect camouflage among litter on the forest ground and on karst surface. Moreover, the species has indistinct banding on the dorsal surface in comparison with its congeners of the *L. ruhstrati* and *L. fasciatus* groups which are clearly banded.

The discovery of this new species increases the number of *Lycodon* species known from Laos to eleven. In the same area, we recently discovered two new bent-toed geckos (*Cyrtodactylus jaegeri* Luu, Calame, Bonkowski, Nguyen & Ziegler, *C. soudthichaki* Luu, Calame, Nguyen, Bonkowski & Ziegler) and two new species of the genus *Gekko* (*G. thakhekensis* Luu, Calame, Nguyen, Le, Bonkowski & Ziegler, *G. bonkowskii* Luu, Calame, Nguyen, Le, Bonkowski & Ziegler) (Luu *et al.*, 2014a, b, 2015a, b). These recent discoveries together with the new *Lycodon* species provide strong evidence that the

northern Truong Son Range, and especially the extensive limestone karst formations in Khammouane Province, central Laos represent a hotspot of endemic biodiversity. The finding of this new *Lycodon* species with its unique colour pattern and morphology suggests that the species diversity within the genus *Lycodon* might be far greater than commonly assumed. Our study further underlines the need to combine detailed morphological and molecular data to delineate species complexes and better understand kinship. Unfortunately, it was not possible to obtain molecular data from all investigated reference species (e.g., *Lycodon fasciatus* MNHN 1928.69 from Xieng Khoang Province, northern Laos) due to formalin-fixed state and long-term storage. Therefore, further field studies are needed to accurately assess the diversity of *Lycodon* in the poorly studied karst forest systems of central Laos.

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Table 4. Diagnostic characters separating *Lycodon banksi* **sp. nov.** from closely related species and the remaining *Lycodon* species recorded from Laos (data obtained from Boulenger, 1893; Smith, 1943; Taylor, 1965; Deuve, 1970; Orlov & Ryabov, 2004; Vogel *et al.*, 2009, 2012; Siler *et al.*, 2013; Luu *et al.*, 2013; Teynié *et al.*, 2014; Neang *et al.*, 2014).

Characters	<i>Lycodon banksi</i> sp. nov.	<i>L. flavozonatus</i>	<i>L. futsingensis</i>	<i>L. meridionalis</i>	<i>L. rufozonatus</i>	<i>L. semicarinatus</i>
Loreal scale touching the orbit	yes	no	no	no	no (rarely yes)	no
Head pattern	dark grey	black with light markings and yellow collar on the nape	grayish brown	yellow-black marble markings	dark brown with yellow borders	black
Ventral scales	241	202-225	193-208	234-246	185-204	211-234
Number of keeled dorsal scale rows	6 dorsal rows on the posterior body third feebly keeled	10-12	0	9 (distinctly keeled)	0	keeled in anterior half
Dorsal pattern	blotched	banded	banded	blotched	banded	banded
Belly pattern	uniform grey cream	yellow with large black spots	cream, speckled posteriorly	uniform yellow with dark spots posteriorly	not reported	yellowish
Blotch/band colour	greyish yellow	yellow	brownish-speckled white	yellow	dark brown	yellowish brown

Characters	<i>L. capucinus</i>	<i>L. davidi</i>	<i>L. fasciatus</i>	<i>L. laoensis</i>	<i>L. ruhstrati</i> <i>abditus</i>	<i>L. septentrionalis</i>	<i>L. subcinctus</i>
Loreal scale touching the orbit	no	no	yes	no	no	yes	yes
Head pattern	dark	olive-brown	dark	dark	dark	light dark	largely white
Ventral scales	182-211	224	182-225	163-192	214-229	202-217	192-230
Number of keeled dorsal scale rows	weakly keeled	middorsal scale rows weakly keeled	weakly keeled	0	5 (middorsal scales keeled)	5-7 (middorsal scales weakly keeled)	10 (middorsal scales weakly keeled)
Dorsal pattern	reticulated	banded	banded	banded	banded	banded	banded
Belly pattern	dirty white	white with dark blotches	white with dark transverse blotches	white	cream	white	greyish
Blotch/band colour	mixed reticulate	pale tan brown	whitish grey	yellowish white	whitish	white	whitish

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- Appendix: Comparative specimens examined**
- Lycodon capucinus*. Laos: Bolikhamxay Province: Tad Leuk: VNUF R.2015.15 (field number: PKK06.15).
- Lycodon davidi*. Laos: Vientiane Province: Vang Vieng: IEBR A.2011.7 (field number: NQT 2010.39).
- Lycodon fasciatus*. Laos: Xieng Khoang Province: MNHN1928.69
- Lycodon fasciatus*. China: Yunnan Province: MNHN1919.148
- Lycodon fasciatus*. China: Tibet: MNHN1912.465
- Lycodon fasciatus*. China: Tibet: MNHN1912.466
- Lycodon fasciatus*. India: MNHN1912.47
- Lycodon futsingensis*. Laos: Khammouane Province: VFU A.2013.4
- Lycodon futsingensis*. Vietnam: Bac Giang Province: IEBR A.0822
- Lycodon futsingensis*. Vietnam: Ha Tinh Province: ZFMK 81474
- Lycodon futsingensis*. Vietnam: Lam Dong Province: IEBR A.0704
- Lycodon futsingensis*. Vietnam: Quang Binh Province: ZFMK 86453
- Lycodon meridionalis*. Vietnam: Bac Kan Province: Ba Be National Park: VNUF R.2012.4 (field number: BBR4). Ninh Binh Province: Trang An: VNUF R.2017.54 (field number: TA 17.54). VNUF R.2017.88 (field number: TA 17.88). VNUF R.2017.126 (field number: ND 17.126). Thanh Hoa Province: Nam Dong: VNUF R.2017.123 (field number: ND 17.123).
- Lycodon paucifasciatus*. Vietnam: Quang Binh Province: ZFMK 80662
- Lycodon paucifasciatus*. Vietnam: Quang Binh Province: ZFMK 86452
- Lycodon ruhstrati abditus*. Laos: Khammouane Province: VFU A.2013.5
- Lycodon ruhstrati abditus*. Vietnam: Quang Binh Province: ZFMK 86451

Description of *Lepthyphantes rossitsae* sp. n. from Turkey (Arachnida: Araneae: Linyphiidae)

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Abstract: A new species of *Lepthyphantes* (*L. rossitsae* sp. n.) was discovered while studying spider material collected from caves near Konya, Turkey. The species is described and illustrated and its relationship to the closely related *L. leprosus* (Ohlert, 1865) are discussed.

Keywords: Taxonomy - spiders - cave fauna - zoogeography.

INTRODUCTION

From a faunistic and zoogeographical point of view Turkey, and Asia Minor in general, is a very interesting area. Its fauna is composed of different elements, some of which, like the Irano-Turanian and Euxinean, are poorly investigated and sometimes incorrectly considered as Mediterranean due to insufficient data about species distribution. Studying these faunistic elements is very important because they extend into Europe and contribute to the composition of the southeastern European fauna. The key to understanding them is to study more deeply the Turkish fauna which will hopefully reveal the true origin and zoogeographical affinities of many species currently known only from southeastern Europe, and may fill many gaps between the known localities of others. Studying the Turkish fauna, especially in the Antalia and Konya regions, will also help us differentiate between Mediterranean and Irano-Turanian faunistic elements among spiders. With this in mind I began a revision of all material from this region available in the collection of the National Museum of Natural History, Sofia. In this first paper a new *Lepthyphantes*, very similar to the common and widespread species *Lepthyphantes leprosus* (Ohlert, 1865), is described from a cave near Çamlık village in the Konya region of Turkey.

MATERIAL AND METHODS

The specimens examined here were collected by hand sampling and studied using a Wild M5A stereomicroscope. Photographs were taken with a Canon EOS 1100D digital camera attached to an Amplival microscope. The coloration is described from specimens preserved in

80% alcohol. The palp and epigyne morphology follows Helsdingen (1965). All measurements are in mm. Leg measurements are in the following sequence: total (coxa and trochanter + femur + patella + tibia + metatarsus + tarsus). The sequence of the chaetotaxy is: femur, patella, tibia, metatarsus. Abbreviations used in the text and figures are: ALE = anterior lateral eyes, AME = anterior median eyes, ctb = big tubercle of cymbium, cts = small tubercle of cymbium, d = dorsal, e = embolus, lc = lamella characteristica, ll = lateral lobe, lt = lateral tooth, nlc = narrow branch of lamella characteristica, p = prolateral, pc = paracymbium, PLE = posterior lateral eyes, PME = posterior median eyes, r = retrolateral, sc = scape, v = ventral. The holotype and 6 female paratypes are kept in the National Museum of Natural History (NMNHS), Sofia, Bulgaria; 1 male and 1 female (also paratypes) are deposited in the Muséum d'histoire naturelle de Genève, Switzerland.

TAXONOMIC PART

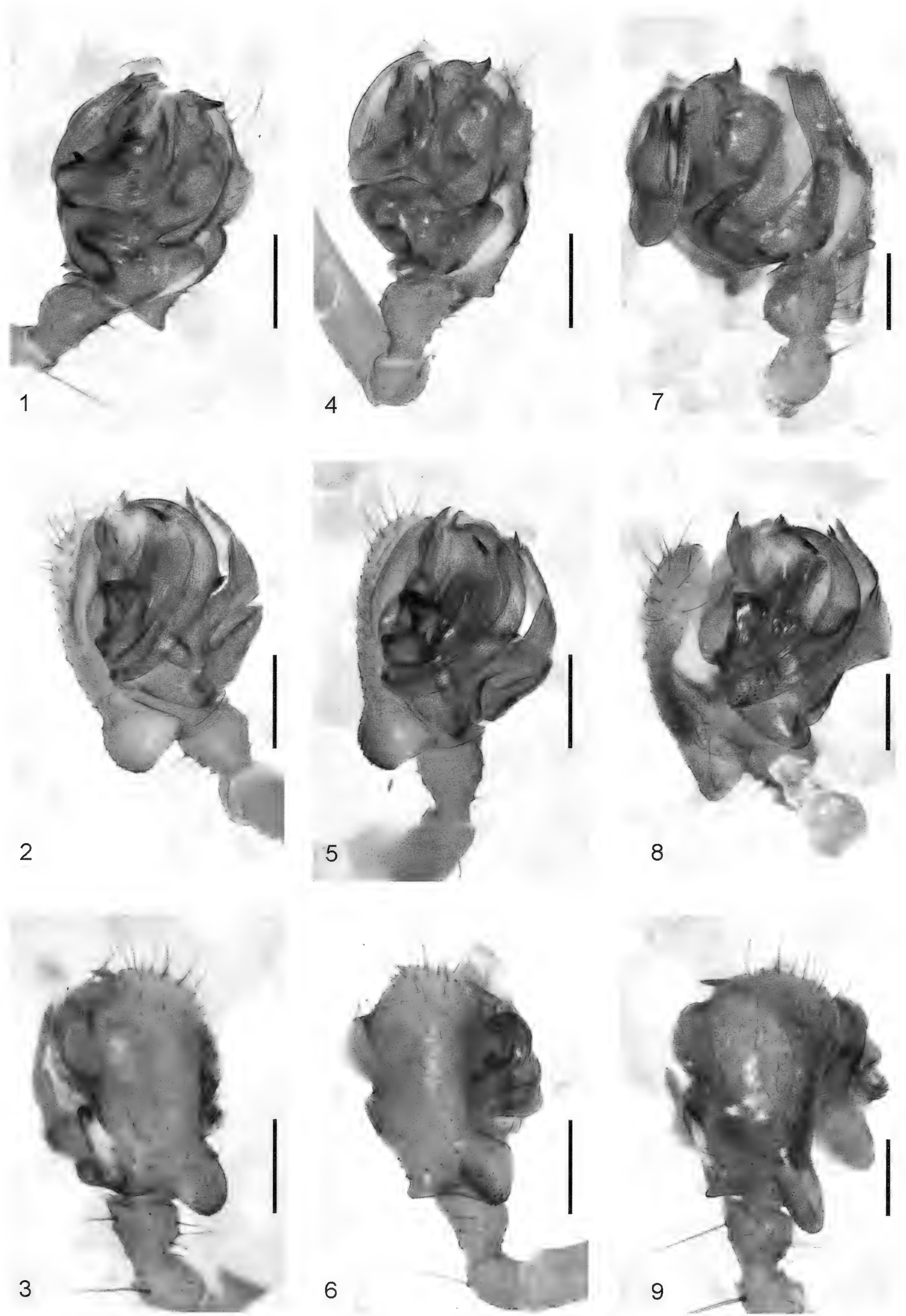
Lepthyphantes rossitsae sp. n.

Figs 1-6, 10-12, 16-22

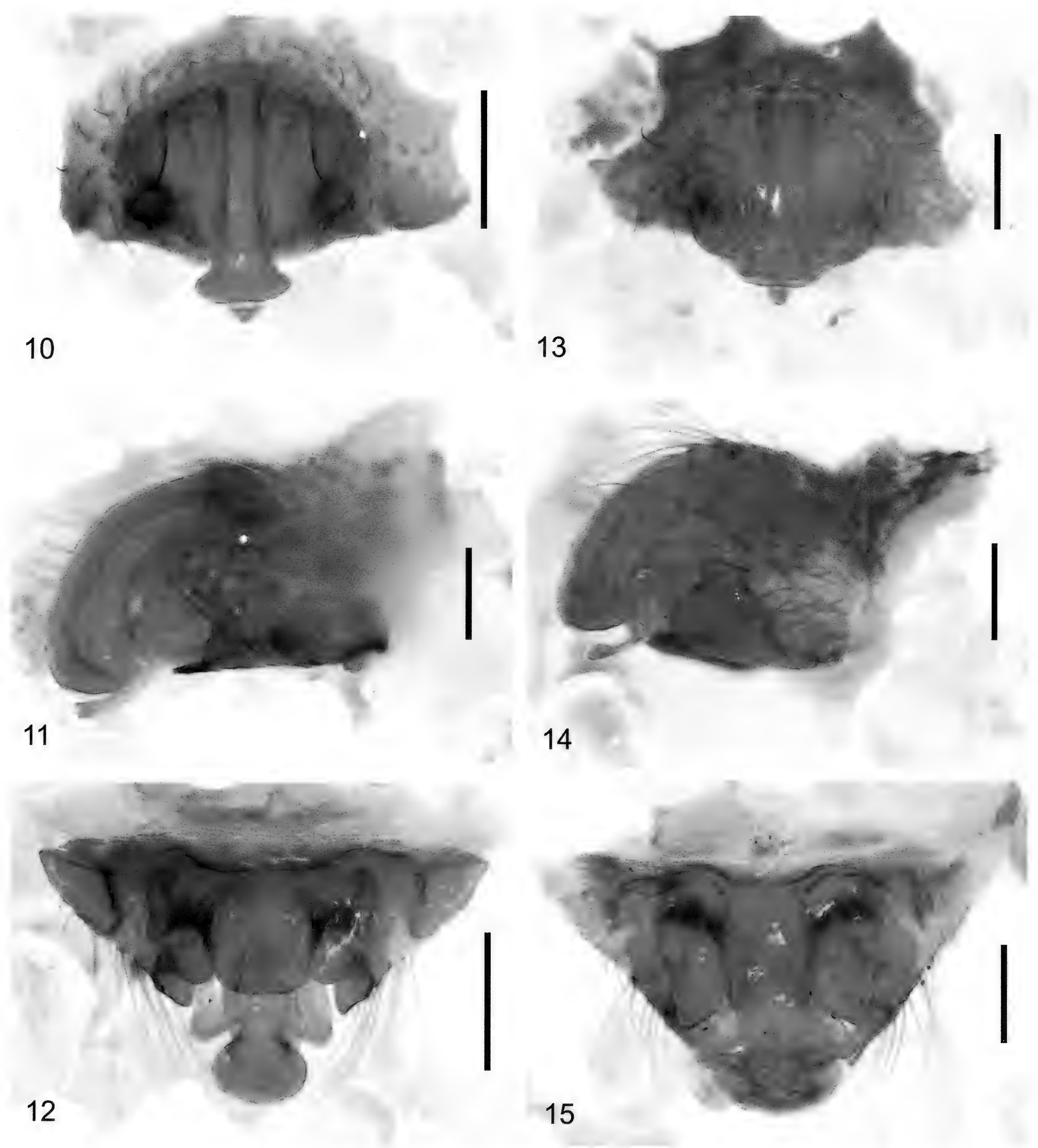
Types: Male holotype, 1 male paratype, 7 females paratypes; Turkey, Çamlık village, Beyşehir district, Mağarasi cave; 10.07.1993; P. Beron leg.

Etymology: I dedicate the species to my wife Rossitsa Dimitrova.

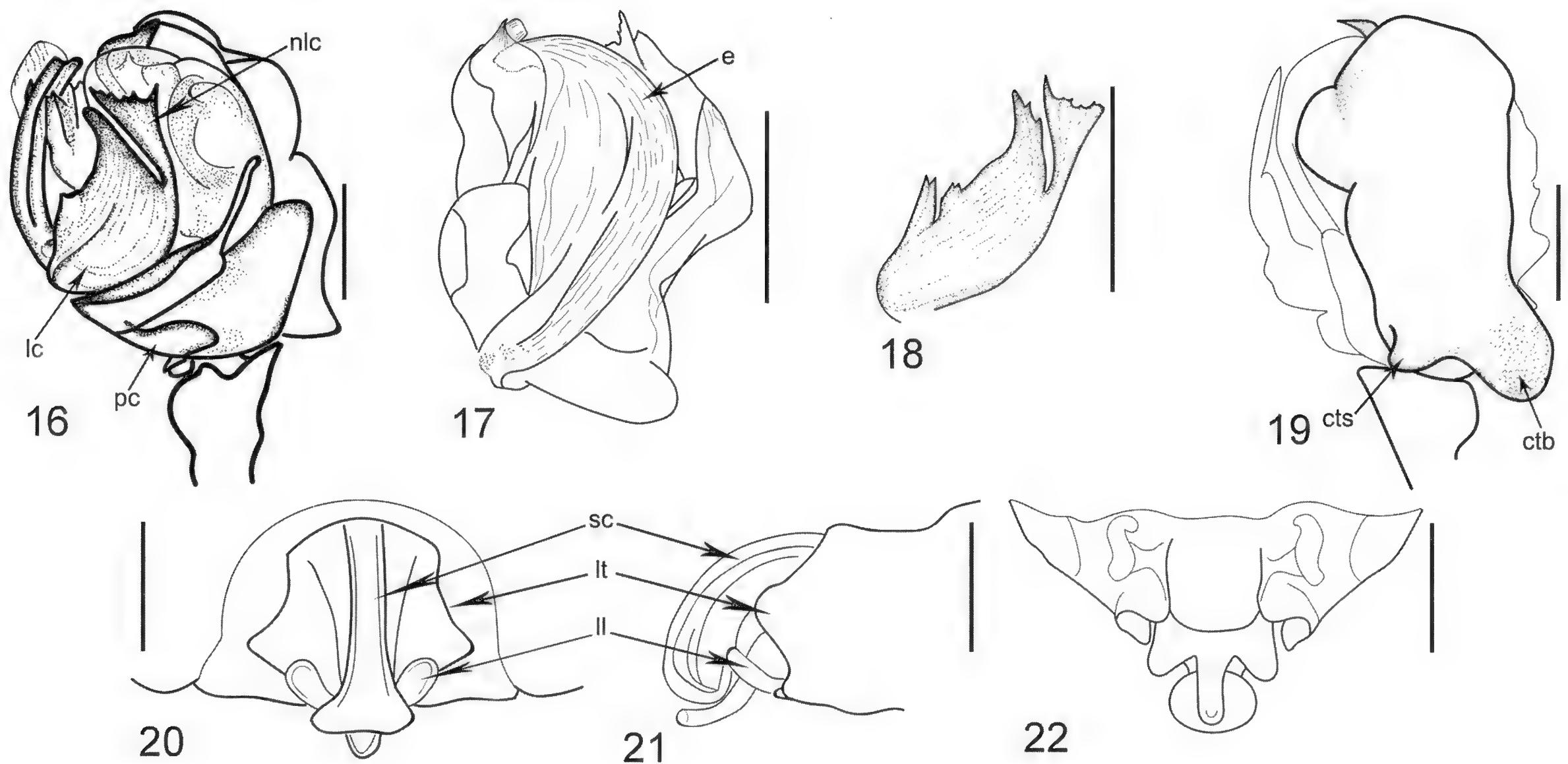
Diagnosis: The new species is very similar to *Lepthyphantes leprosus* in somatic and genital characters. The male of *L. rossitsae* sp. n. can be distinguished by the shape of the narrow branch of the lamella



Figs 1-9. *Lepthyphantes rossitsae* sp. n., male holotype (1-3), male paratype (4-6); *Lepthyphantes leprosus*, male (7-9). (1, 4, 7) Palp, retrolateral view. (2, 5, 8) Palp, dorsal view. (3, 6, 9) Palp, prolateral view. Scale 0.2 mm.



Figs 10-15. *Lepthyphantes rossitsae* sp. n., female paratype (10-12); *Lepthyphantes leprosus*, female (13-15). (10, 13) Epygine, ventral view. (11, 14) Epygine, lateral view. (12, 15) Epygine, dorsal view. Scale 0.2 mm.



Figs 16-22. *Leptyphantes rossitsae* sp. n., male holotype (16-17, 19), male paratype (18), female paratype (20-22). (16) Palp, retrolateral view. (17) Embolus. (18) Lamella characteristica. (19) Palp, dorsal view. (20) Epygine, ventral view. (21) Epygine, lateral view. (22) Epygine, dorsal view. Scale 0.2 mm.

characteristica, which is shorter and wider apically (Figs 1, 4, 16, 18), while in *L. leprosus* it is longer, narrower and forked at the end (Fig. 7). The embolus in both species is very similar, but in *L. rossitsae* sp. n. the teeth at its base are less numerous and tiny (Figs 2, 5, 17), while in *L. leprosus* they are more numerous and slightly bigger (Fig. 8). Also the big tubercle of the cymbium (Figs 3, 6, 19) is shorter and wider than in *L. leprosus* (Fig. 9). The female epigyne (Figs 10-12, 20-22) has almost the same lateral wall and lateral lobe as in *L. leprosus*, but the scape in *L. rossitsae* sp. n. is thinner and longer and there are no lateral teeth (Figs 13-15).

Description of male (holotype): Measurements: Total length 3.85; cephalothorax length 1.48, width 1.25; sternum length 0.68, width 0.45; chelicera length 0.72, width 0.30; abdomen length 2.35, width 1.45; leg I length 11.75 (0.80 + 3.00 + 0.45 + 3.00 + 3.00 + 1.50); leg II length 10.75 (0.60 + 2.80 + 0.45 + 2.70 + 2.85 + 1.35); leg III length 8.45 (0.55 + 2.35 + 0.40 + 1.90 + 2.25 + 1.00); leg IV length 10.70 (0.62 + 2.70 + 0.40 + 2.63 + 3.00 + 1.35). Eyes: Both eye rows straight; AME smaller than other eyes, touching each other. Other eyes approximately equal in size. AME diameter 0.05; ALE, PLE, PME diameter 0.09; ALE separated from AME by 0.03. PME separated from PLE and each other by 0.08, ALE touching PLE. Chelicerae with 2 large distal and 2 small apical teeth on promargin and with 1 large distal tooth on retromargin. Coloration: carapace, sternum, chelicerae and legs yellow-brown. Abdomen grey, with white pattern (not very well preserved). Leg chaetotaxy: leg I (1p, 1d, 2d2p1v1r, 1d1r); leg II (-, 1d, 2d1r1v, 1d1p); leg III (-, 1d, 2d1r, 1d); leg IV (-, 1d, 2d1r, 1d).

Palps (Figs 1-6, 16-19): Cymbium with one big and one small tubercle in its basal part, visible in dorsal view (Figs 3, 6, 19). Paracymbium connected to cymbium with its flat internal part. Lamella characteristica broad and incised, bifid. Its narrow distal branch gradually widening to a fan shaped apical part (Figs 1, 4, 16). Embolus bent, sickle-shaped, bearing small teeth near its base (Figs 4-5, 17).

Description of female (paratype): Measurements: Total length 4.05; cephalothorax length 1.60, width 1.25; sternum length 0.85, width 0.75; chelicera length 0.72, width 0.30; abdomen length 2.66, width 1.70; leg I length 10.47 (0.65 + 2.95 + 0.47 + 2.50 + 2.50 + 1.40); leg II length 9.45 (0.63 + 2.40 + 0.47 + 2.30 + 2.40 + 1.25); leg III length 7.00 (0.54 + 2.00 + 0.40 + 1.35 + 1.85 + 0.86); leg IV length 9.35 (0.56 + 2.40 + 0.40 + 2.25 + 2.52 + 1.22). Eye arrangement and coloration as in male. Chelicerae with 4 large teeth on promargin and 4 small apical teeth on retromargin. Leg chaetotaxy: leg I (1p, 1d, 2d1p2v1r, 1d1p1r); leg II (-, 1d, 2d1v2r, 1d1p1r); leg III (-, 1d, 2d1v1r, 1d); leg IV (-, 1d, 2d1r, 1d).

Epigyne (Figs 10-12, 20-22): Lateral wall without teeth (Figs 10-11, 20-21). Scape long and narrow, widening at the end (Figs 10, 20). Two lateral lobes on each side of scape (Figs 10-11, 20-21).

Distribution: Known only from the type locality.

Remarks: As already stated by Helsdingen (2009), the splitting of *Leptyphantes* s. l. into several distinct genera by Saaristo & Tanasevitch (1996, 1999, 2000, 2001) not only makes species identification difficult and

user-unfriendly, but also leaves *Lepthyphantes* s. str. as a heterogeneous group containing all species that could not be placed with certainty in any of the present genera close to *Lepthyphantes*. This is also the case with *Lepthyphantes leprosus*. Previously it was listed as part of the *Lepthyphantes nebulosus* group. Meanwhile most of the species from this group have been transferred to *Megalepthyphantes* Wunderlich, 1994, but *Lepthyphantes leprosus* remained in *Lepthyphantes* along with some other species, most of which are clearly not related to each other. Since the new species described here is very close to *Lepthyphantes leprosus*, it is provisionally also placed in *Lepthyphantes*.

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A new species of *Phyxioschema* (Araneae: Dipluridae) from Iran

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Abstract: *Phyxioschema gedrosia* sp. nov. is described from a single male collected in Sistan & Baluchistan Province, southeastern Iran. The new species appears most closely related to *P. roxana* Schwendinger & Zonstein, 2011 found in Uzbekistan and Tajikistan, from which it clearly differs by the shape of tibia II (angle between article and its ventral spur acute instead of rounded; apical megaspines of spur situated one behind the other instead of side by side) and of metatarsus II (proventral keel subquadrangular instead of triangular). The presence of two additional *Phyxioschema* populations in southwestern and central Iran is mentioned and the currently known distribution of the genus in Iran is mapped.

Keywords: Taxonomy - spiders - Mygalomorphae - Baluchistan.

INTRODUCTION

The genus *Phyxioschema* was previously known from six species in tropical Thailand (Raven & Schwendinger, 1989; Schwendinger, 2009) and from two species in arid Central Asia (Schwendinger & Zonstein, 2011). One of the latter, *P. raddei* Simon, 1889, has been known for almost 120 years and is widely distributed in the region (confirmed records from Iran, Turkmenistan, Tajikistan, Kazakhstan; possibly also present in Afghanistan, Kyrgyzstan and Pakistan; Schwendinger & Zonstein, 2011: 38; Zamani, 2016; Zamani *et al.*, 2018). The other Central Asian species, *P. roxana* Schwendinger & Zonstein, 2011, was described more recently and is so far only known from eight upland localities in Uzbekistan and Tajikistan (Schwendinger & Zonstein, 2011: 43-44). Here we describe a new species from southeastern Iran and report on two *Phyxioschema* populations in southwestern and central Iran, all of which lie far outside the previously known range of the genus (Schwendinger & Zonstein, 2011: fig. 1).

MATERIAL AND METHODS

External morphology was studied and drawn with a Zeiss SV11 stereomicroscope. Images were taken at several focal planes by using a digital camera mounted on a Leica MZ APO stereomicroscope and then assembled with the AutoMontage® system.

Body measurements were taken with a stereomicroscope and are given in mm. The total body length includes the chelicerae but not the spinnerets. Lengths of leg and palp articles were measured on the dorsal side, and lengths of spinneret articles on the ventral side, from midpoint of distal margin to midpoint of proximal margin. Leg and palp measurements are given as follows: total length (length of femur + length of patella + length of tibia + length of metatarsus [absent on palp] + length of tarsus). Measurements of eye diameters and distances between eyes are based on the dimensions of the whole eye lenses, not just their light-coloured central portions. The curvature of the eye rows refers to an imaginary line running through the centre of each eye in the same row. Leg formula is from shortest to longest leg. The number of spines and their position (dorsal, ventral, pro- and retrolateral) on the leg articles of both sides are given. Spine counts do not include the spinules on femora I and II and on tibia II. Counts taken from both sides of the body (e.g., left and right tarsi I) are separated by a forward slash. The terminology follows Raven (1981), Schwendinger (2009) and Schwendinger & Zonstein (2011).

Abbreviations: AME, ALE, PME, PLE = anterior (posterior) median (lateral) eyes; d = dorsal; MOQ = median ocular quadrangle; p = prolateral; r = retrolateral; v = ventral.

All specimens examined are deposited in the Muséum d'histoire naturelle, Genève, Switzerland (MHNG).

TAXONOMY

Phyxioschema gedrosia sp. nov.

Figs 1-4

Material: Male holotype; Iran, Sistan & Baluchistan Province, Bashagard Mts, Haboudan Village, 26°37'2.8"N, 60°23'38"E; 17.XI.2017; leg. A. Zamani.

Etymology: The specific epithet, a name in apposition, is the ancient Greek name of modern Baluchistan (= Baluchestan).

Diagnosis: Medium-sized species with fairly stout legs (Fig. 1). Different from all other *Phyxioschema* species by one apical megaspine on ventral spur of tibia II situated behind the other (Fig. 3G-H, I-J), not beside it. Distinguished from the Central Asian *P. raddei* and *P. roxana* by angle between tibia II and its ventral spur being much narrower and acute rather than rounded (Figs 2G, 3I-J cf. Schwendinger & Zonstein, 2011: figs 2D-E and 6E-F); proventral keel on metatarsus II prominent and subquadrangular (Figs 2G, 3L-O) instead

of low and rounded (as in *P. raddei*; Schwendinger & Zonstein, 2011: figs 2D, 3L-P) or prominent and subtriangular (as in *P. roxana*; Schwendinger & Zonstein, 2011: figs 6E, 7K-N).

Description: *Male:* Colour in alcohol: Carapace (Figs 1, 2A) uniformly light brown; eye mound black. Palpal coxae light brown, prolateral zone only indistinctly lighter than rest of ventral side (Fig. 2B). Labium with cream-coloured anterior half and light reddish brown posterior half (Fig. 2B). Sternum mostly light brown; margin, fused anterior pair of sigilla (forming postlabial depression) and separated three pairs of sigilla light reddish brown (Fig. 2B). Legs (including ventral side of coxae) mostly light brown, their ventral side slightly lighter than dorsal side; entire dorsal side of tibia I, patches at bases of spines on ventral side of tibia I (Fig. 2F), entire metatarsus I and most of tarsus I (except for pseudosegmentation) distinctly darker; small retrodorsal-distal patch, large prodorsal-prolateral-distal patch (extending back to band of hooked spinules) and entire ventral spur of tibia II, and proximal third



Fig. 1. *Phyxioschema gedrosia* sp. nov., habitus of live male holotype (photo by A. Zamani).

of metatarsus II dark reddish brown (Fig. 2G); no light longitudinal dorsal stripes on patellae discernible, indistinct ones present on tibiae and metatarsi I. All membranes uniformly cream-coloured. Opisthosoma mostly light greyish brown, without pattern (Figs 1, 2C); ventral side of posterior lateral spinnerets greyish brown, mottled with light spots.

Body 11.7 long. Carapace (Fig. 2A) 4.5 long, 3.9 wide, oval, almost flat, quite densely covered with fine, relatively long, adpressed grey hairs (most straight, few slightly curved or wavy); few stronger bristles on and in front of eye mound, two bristles in front of pitlike fovea and several bristles on posterolateral corners of carapace. Eyes (Fig. 3A) on low mound; eye group 0.41 long, anterior eye row distinctly procurved, 0.71 wide, posterior eye row straight, 0.78 wide. Eye diameters and interdistances: AME 0.14, ALE 0.24, PME 0.16, PLE 0.21; AME-AME 0.09, AME-ALE 0.06, PME-

PME 0.28, PME-PLE 0.04. MOQ 0.28 long, 0.33 wide anteriorly, 0.55 posteriorly.

Chelicerae weak, grooves with 9/11 prolateral teeth and about 30 tiny medioproximal denticles. Palpal coxae (Fig. 2B) 1.1 long, 0.7 wide; prolateral-distal lobe indistinct, with indistinct serrula on ridge. Labium (Fig. 2B) 0.3 long, 0.7 wide, anterior edge distinctly setose, followed by pallid zone without setae; posterior part pigmented, with few setae. Sternum (Fig. 2B) 2.3 long, 1.9 wide, cordate, with distinctly sunken post-labial sigilla (medially fused with each other and with labiosternal suture) and three pairs of indistinct marginal sigilla.

Palps (Fig. 3B-C). Measurements: total length 4.4 (1.8 + 0.7 + 1.2 + 0.7). Spination: tibia r1 (very long); tarsus p1, r1 (much shorter). 8+8 trichobothria in two rows on tibiae, 10 trichobothria in an irregular row on tarsi. Palpal organ with a narrow kidney-shaped subtegulum, a much

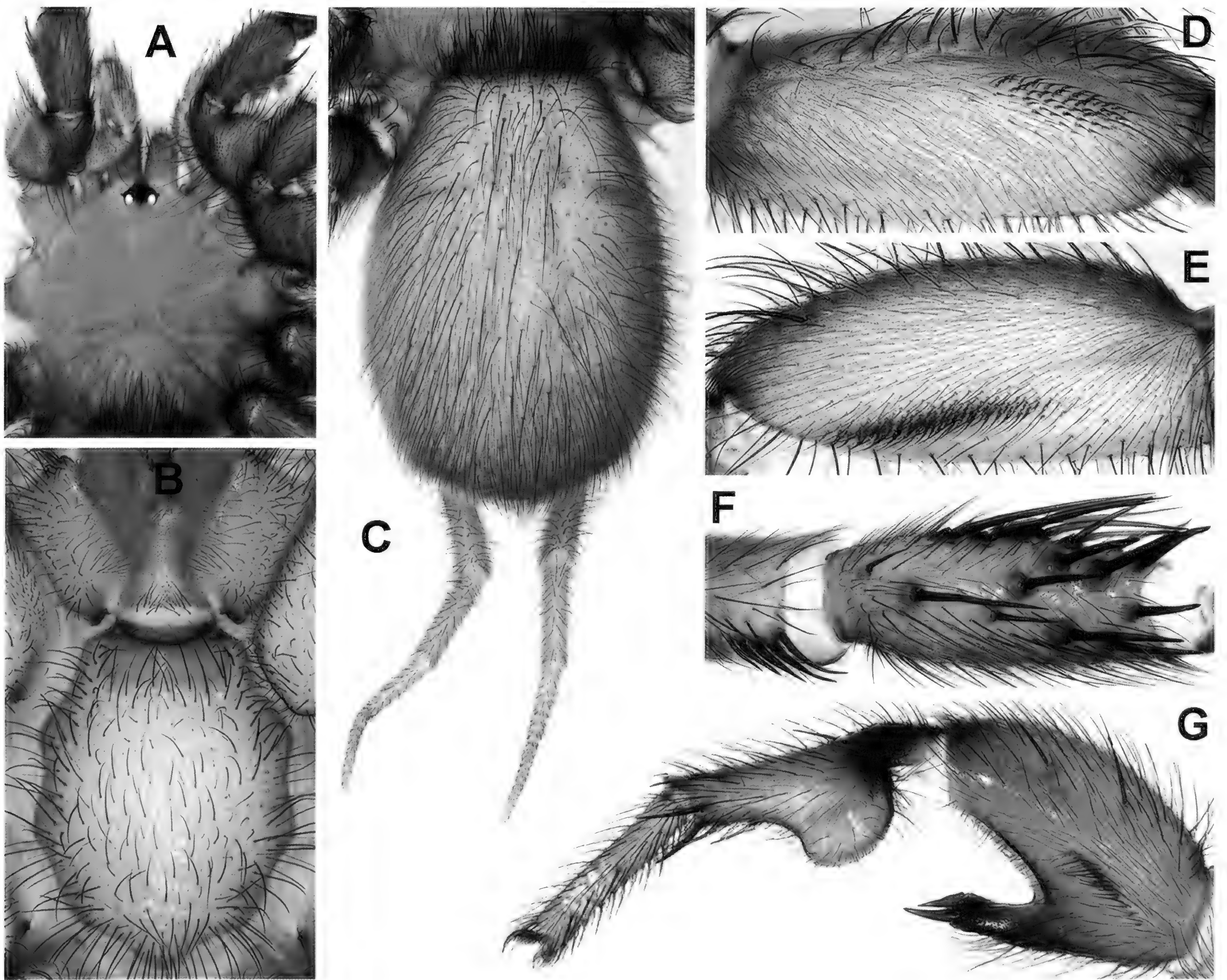


Fig. 2A-G. *Phyxioschema gedrosia* sp. nov., male holotype. (A) Prosoma, dorsal view. (B) Palpal coxae, labium and sternum, ventral view. (C) Opisthosoma, dorsal view. (D) Right femur I, retrodorsal view. (E) Right femur II, prolateral view. (F) Left tibia I, ventral view. (G) Right tibia, metatarsus and tarsus II, prolateral view.

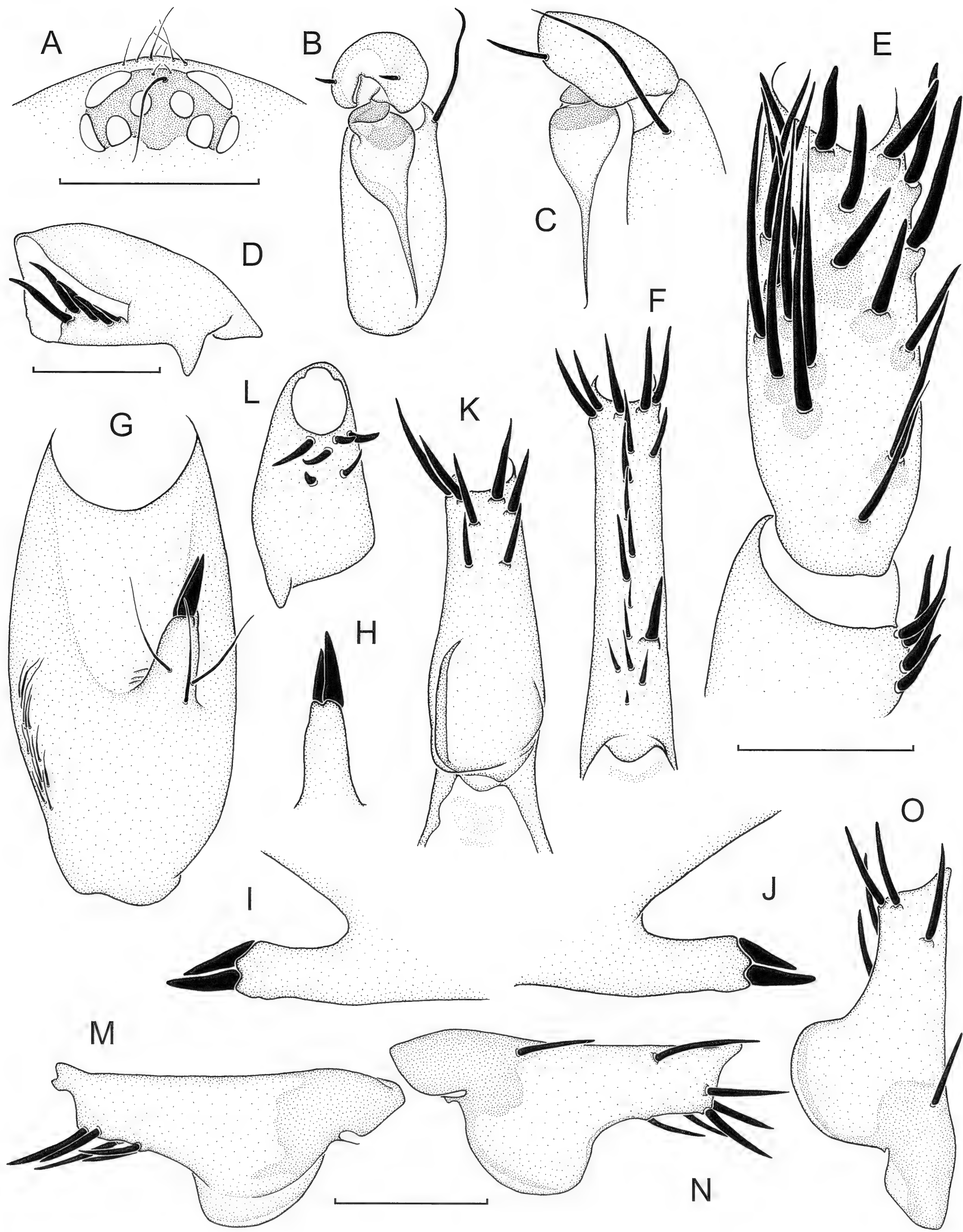


Fig. 3A-O. *Phyxioschema gedrosia* sp. nov., male holotype. (A) Eye region, dorsal view. (B) Left palp, ventral view. (C) Left palpal tarsus and palpal organ, retrolateral view. (D) Left patella I, retrolateral and slightly retroventral view. (E) Left tibia I and distal part of patella I, ventral view. (F) Left metatarsus I, ventral view. (G) Left tibia II, ventral view. (H) Right tibial spur, ventral and slightly retrolateral view. (I) Left tibial spur, retrolateral view. (J) Right tibial spur, retrolateral view. (K) Left metatarsus II, ventral view. (L) Same, distal view. (M) Same, retrolateral view. (N) Same, prolateral view. (O) Right metatarsus II, prolateral view. All scale lines 1.0 mm; A-C, D, E-L and M-O to same scale.

wider, asymmetrically pyriform tegulum and a quite long (about as long as tegulum), almost straight embolus tapering to a very slightly curved tip.

Legs 2134. Leg I 11.5 long (3.4 + 2.0 + 2.4 + 2.3 + 1.4); leg II 11.3 long (3.3 + 1.8 + 2.4 + 2.2 + 1.6); leg III 12.1 long (3.4 + 1.7 + 2.2 + 3.1 + 1.7); leg IV 15.2 long (3.8 + 2.1 + 3.1 + 4.2 + 2.0). Tibia I 1.06 wide, tibia II 1.30, tibiae III and IV 0.71 each. All tarsi pseudosegmented and densely armed with spines. Metatarsal preening combs absent. Leg I: metatarsus with one proximoventral spine stronger than nearby ones (similar to distoventral spines; on left side more pronounced than on right side; Fig. 3F); tibia distinctly incrassate (150% of tibiae III or IV width), ventrally flattened in some areas (mostly in distal half), carrying ventral megaspines with bases surrounded by darker pigment (Figs 2F, 3E); patella with a curved row of 4/5 spines retroventrally (the distal ones longer and curved, the proximal ones shorter and slightly sigmoid), without triangular projection on retrolateral margin (Fig. 3D); distal part of femur with relatively short and wide band of hooked spinules retrodorsally (Fig. 2D). Leg II: proximal part of metatarsus with two widely separated keels (Fig. 3K-L): the proventral one large, almost quadrangular in prolateral view and with a sharp, very prominent ventral edge (Figs 2G, 3L-O), the retroventral keel indistinct, much less elevated and with an angular but not elevated ventral edge (Fig. 3L-M); tibia strongly incrassate (180% of tibiae III and IV width; Figs 2G, 3G), band of elongate spinules on prolateral side straight, slightly inclined from longitudinal axis of tibia, reaching beyond height of distal side of ventral spur (Fig. 2G); ventral spur of tibia apically tapering in ventral view (Fig. 3G) and only indistinctly widened in lateral view (Figs 2G, 3I-J), its apex not bilobed and carrying two megaspines, one situated behind the other (not side by side as in all other *Phyxioschema* spp.); dorsal megaspine shorter and more inclined from axis of tibial spur than ventral one (Figs 2G, 3G-J); band of hooked spinules prolaterally on femur II (Fig. 2E) much longer and slightly narrower than corresponding band on femur I (Fig. 2D).

Spination: I: patella p1, v4/5; tibia p1/2, v20; metatarsus v13/17; tarsus v13. II: patella p2; tibia p2, v2 megaspines; metatarsus p2, v7; tarsus v17. III: patella p2/3, r1; tibia d2, p2, r2, v5; metatarsus d5, p3, r1, v10/11; tarsus v12. IV: patella p2, r1; tibia d2, p2, r2, v6; metatarsus d3/4, p2, r1, v9/10; tarsus v9.

Trichobothria: 9-10+9-10 in two rows on tibiae; 10-12 in a straight row on metatarsi; about 9-10 in a straight row on tarsi. Paired claws with 10-12 teeth in sigmoid row; unpaired claw with 6-7 quite long, sessile teeth.

Opisthosoma 6.3 long, 4.4 wide; covered with fine adpressed hairs (mostly in posterior part) interspersed with fewer fine dark hairs and long dark bristles with orange-brown sockets (Fig. 2C). Posterior median spinnerets 0.6 long; posterior lateral spinnerets 5.9 long (proximal

article 1.7, median article 1.7, pseudosegmented distal article 2.5).

Female: Unknown.

Relationships and taxonomic status: Due to the stouter and more spiny legs with incrassate tibiae I and II and a ventrally partly flattened tibia I, *P. gedrosia* sp. nov. clearly belongs to the Central Asian species group which also includes *P. raddei* and *P. roxana*. Judging from the distally narrow ventral spur on tibia II and from the strongly projecting and sharp proventral keel on metatarsus II, *P. gedrosia* sp. nov. appears most closely related to *P. roxana*. The characteristic and strongly autapomorphic ventral coupling spur of tibia II with its apical megaspines situated one behind the other (Figs 2G, 3G-J) is not completely unparalleled. In *P. raddei* the retrolateral-apical lobe of the coupling spur is slightly bent dorsad, and consequently the retrolateral megaspine is situated slightly more dorsally than the prolateral one (see Schwendinger & Zonstein, 2011: figs 2C-E, 3G), though not behind it as in *P. gedrosia* sp. nov. This may be an indication for a close relationship between *P. raddei* and *P. gedrosia* sp. nov., as is the presence of an enlarged ventral spine in the proximal part of metatarsus I. However, other taxonomic characters (narrow apex of ventral spur of tibia II; presence of only two keels on metatarsus II, the proventral one large and very prominent) rather supports a closer relationship between *P. roxana* and *P. gedrosia* sp. nov. The female of the new species is unknown and characters of the vulva thus cannot be evaluated for phylogenetic relationship, but in view of the very close resemblance of the vulvae in *P. raddei* and *P. roxana* we do not expect to find much useful information to this respect once the missing female is discovered.

Due to the still unresolved taxonomic status of *Afghanothele lindbergi* Roewer, 1960 and *A. striatipes* Roewer, 1960 and due to the continuous inaccessibility of their type localities in Afghanistan, it is possible that *P. gedrosia* sp. nov. as well as *P. roxana* will be synonymised with one of these two nominal species in the future. A further new *Phyxioschema* locality recently discovered by the second author in southwestern Iran (so far only females available) may belong to any of the currently known species, but we would not be surprised if it represents yet another undescribed species. The *Phyxioschema* diversity in Central Asia is possibly much underestimated, as it was in Thailand (Raven & Schwendinger, 1989; Schwendinger, 2009). More spider sampling in Central Asia is desirable but unfortunately this has long been (and still is) difficult due to political and sectarian conflicts.

Distribution, habitat and phenology: The holotype of *P. gedrosia* sp. nov. was collected from its web using meal worms as bait. The type locality in southeastern Iran (Fig. 4, locality 6) lies in the driest region of Central Asia. The habitat is a deserted mountainous

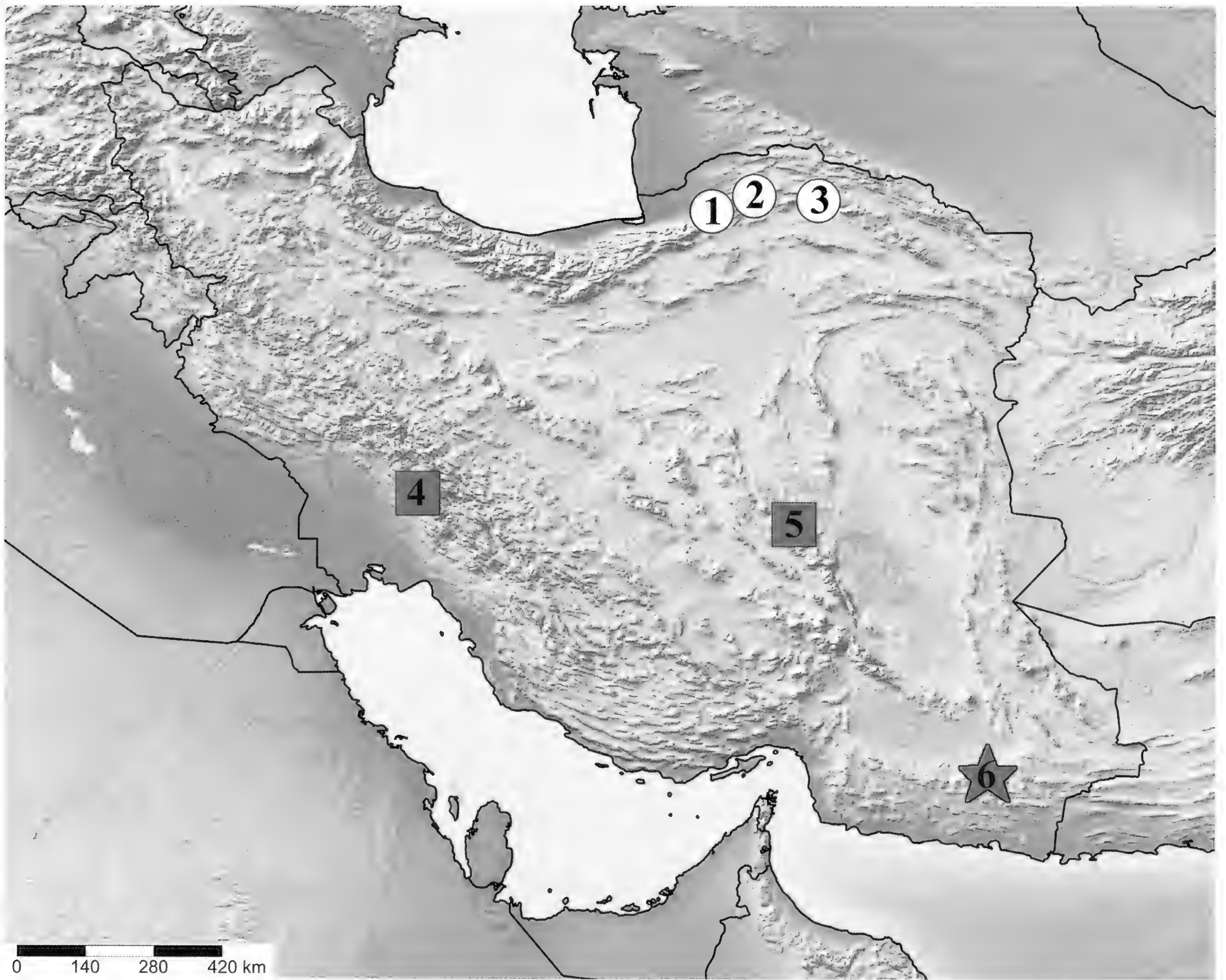


Fig. 4. Localities of *Phyxioschema* spp. in Iran. Circle: *P. raddei*; star: *P. gedrosia* sp. nov.; square: *Phyxioschema* sp. White symbols refer to literature records, red symbols refer to our new data. 1 = Golestan Prov., Shahpasand; 2 = North Khorasan Prov., near Dasht (Schwendinger & Zonstein, 2011); 3 = North Khorasan Prov., Assadi, 30 km S of Bojnourd, 37°14'N, 57°15'E (Zamani *et al.*, 2017); 4 = Khuzestan Prov., Izeh, Takht-e Kashan; 5 = Kerman Prov., 20 km north of Ravar; 6 = Sistan & Baluchistan Prov., Bashagard Mts, Haboudan Village.

area, with the main vegetation consisting of the palm *Nannorrhops ritchiana*.

The male holotype was collected immature in November 2017 and moulted to maturity in February 2018. This is earlier than in *P. roxana* (May to June) and in *P. raddei* (May to July).

Phyxioschema sp.

Fig. 4

Material examined: 3 females and 1 juvenile; Iran, Khuzestan Province, Izeh, Takht-e Kashan, 31°50'N, 49°52'E, 15.III.2018; leg. A. Zamani. – 1 large juvenile male (probably subadult; ex coll. A. Senglet); Iran, Kerman Province, 20 km north of Ravar, 31°26'N, 56°51'E, 1150 m alt.; 14.IV.1974; leg. J. Garzoni.

Remarks: The available material consists only of females and juveniles, which show no clearly distinctive features. The vulva of the largest female from Khuzestan is slightly different from those of *P. raddei* and *P. roxana* females illustrated in the literature (Schwendinger & Zonstein, 2011: figs 4A-H, 5A-H, 8A-H), and therefore it is quite possible that the specimens from southwestern Iran belong to another new species. However, until an adult male from this population becomes available, this will remain an open question. The juvenile male from Kerman may be conspecific with the holotype of *P. gedrosia* sp. nov., but that also requires confirmation by collecting adult males at the same locality.

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The Decapoda (Crustacea) described by Henri de Saussure

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Abstract: Henri de Saussure described 44 species of decapod; these are listed, the location of the type specimens is given where known and the current nomenclatural combination is given. Type specimens of 34 of the species have been identified in the collections of the Muséum d'histoire naturelle de Genève, and label data and the condition of the specimens are reported for each of these.

Keywords: Crab - shrimp - Mexico - Cuba - Haiti - St Thomas - Guadeloupe - Geneva - type catalogue.

INTRODUCTION

Henri de Saussure described 44 species of decapod, all of them from Mexico and the Caribbean. The specimens described in Saussure's first Crustacea publication (Saussure, 1853) were obtained from the natural history dealers Verreaux (father and sons) in Paris. These specimens were probably left with Félix-Edouard Guérin-Méneville (editor of the revue in which the descriptions were published) so that the latter could compare them with some Crustacea he was describing himself. Guérin-Méneville's collection was then acquired by Thomas Bellerby Wilson and donated to the Academy of Natural Sciences of Philadelphia before 1857 (Boyko, 2000), the transaction taking place while Saussure was on his expedition to Mexico and the Antilles (Hollier & Hollier, 2012). Most of the other species described by Saussure appear to have been collected on that expedition, although the specimens from Guadeloupe must have been collected by someone else. His last Crustacea publication (Saussure, 1858) appeared in the *Mémoires de la Société de Physique et d'histoire naturelle de Genève* but was also printed separately as the first part of Saussure's *Mémoires pour servir à l'Histoire naturelle du Mexique, des Antilles et des Etats-Unis* with the same publication date but different pagination: the pagination cited here refers to the former. Most of the original descriptions are cursory and without illustrations, but most of the species are given longer subsequent descriptions and are illustrated in the final publication (Saussure, 1858). Apart from the type specimens known to be deposited in North America, the type specimens of nearly all of Saussure's species can be identified in the collections of the Muséum d'histoire naturelle in Geneva (MHNG). It remains possible that some type specimens were deposited in other institutions.

Leo Zehntner (1864-1961), who acted as Saussure's assistant in the 1890s, described twenty three species of decapod collected by Maurice Bedot (later the director of the MHNG) and Camille Pictet during an expedition to what is now Indonesia (Zehntner, 1894) and also revised many other specimens in the collection (Hauser, 1972). More recently, Richard Bott (1902-1974) and Michael Türkay (1948-2015) have revised parts of the collection and identified a number of Saussure's type specimens.

ARRANGEMENT AND FORMAT

The species are listed in alphabetic order. The format for each is:

specific epithet Author, publication: page [*Original generic placement*].

Provenance as given in the original description, depository. Type series.

Other information given by Saussure. Enumeration of the type specimens in the MHNG, with specimen condition and label data. Type material in other collections. Other information.

Currently valid combination

Nomenclature follows WoRMS (WoRMS Editorial Board, 2018).

The following abbreviations are used in the list:

ANSP Academy of Natural Sciences of Philadelphia, USA

MHNG Muséum d'histoire naturelle, Geneva

USNM United States National Museum of Natural History, Washington

CATALOGUE

americana Saussure, 1857b: 305 [*Pseudothelphusa*].
Haiti. Unspecified series.

The MHNG collection contains three specimens [MHNG-ARTO-16401, MHNG-ARTO-16402 and MHNG-ARTO-16436] transferred from the dry collection into alcohol and stored in tubes in separate jars. The first specimen is in fragments, the second lacks many appendages and most of those that remain are detached, the third is in fragments. The original identification label, which is still pinned in Crustacea box 183, has “Cuba M H de Saussure” written on it. It is not clear if this is an error, whether the locality given in the original description and in Saussure (1858) is incorrect, or if these specimens are not part of the type series. Bott (1970: 334) considered them likely to be syntypes.

Pseudothelphusa americana Saussure, 1857

americana Saussure, 1857b: 305-306 [*Sesarma*].
Ile de Saint-Thomas. Unspecified series.

The MHNG collection contains two pinned dry specimens [MHNG-ARTO16408 and MHNG-ARTO-16409] in Crustacea box 194. They are accompanied by a small tube secured by a pin through the cork stopper containing a gonopod. The identification label pinned in the box has “St Thomas, M H de Saussure” written on it, indicating that the specimens are syntypes. The second specimen has lost one of the right legs.

Armases americanum (Saussure, 1857)

americanus Saussure, 1857b: 304-305 [*Chlorodius*].
Haiti. Unspecified number of ♂.

The MHNG contains four pinned dry specimens under the name *Leptodius americanus* in Crustacea box 169. One specimen [MHNG-ARTO-16416] has “Haiti ♂ M H de Saussure” written on the identification label pinned in the box and is part of the type series. This specimen has lost one leg from each side. The other three specimens [MHNG-ARTO-16438 to MHNG-ARTO-16440] have “Guadeloupe, M H de Saussure” written on the identification label pinned in the box and are probably not part of the type series. Since the type series was unspecified, the type specimen should be regarded as a syntype.

A junior synonym of *Xanthodius parvulus* (Fabricius, 1793)

americanus Saussure, 1858: 472-473, fig. 31 [*Oplophorus*].

L'embouchure des rivières de l'Ile de Haiti. Unspecified series.

The MHNG collection contains five pinned dry specimens [MHNG-ARTO-13988 to MHNG-ARTO-13992] in Crustacea box 32 under the name *Xiphocaris elongata*. The species name label pinned in the box has “= americanus Saussure, Haiti, M H de Saussure” indicating that they are syntypes. The specimens are pinned and all have

lost appendages; MHNG-ARTO-13989 has also lost the front of the carapace.

A junior synonym of *Xiphocaris elongata* (Guérin-Méneville, 1855)

americanus Saussure, 1857c: 502 [*Panopeus*].
Guadeloupe. Unspecified series.

The MHNG collection has six pinned dry specimens [MHNG-ARTO-16417 to MHNG-ARTO-16422] in Crustacea box 181. The identification label pinned in the box has “Guadeloupe ♂♀ M H de Saussure” written on it, indicating that the specimens are syntypes. The first two have card supports on the pin, and all of the specimens have lost at least one leg.

Panopeus americanus Saussure, 1857

anceps Saussure, 1857c: 502 [*Lupea*].
Cuba. Unspecified series.

The MHNG collection contains the lectotype designated by Türkay (1971: 125) [MHNG-ARTO-16368] in Crustacea box 149. This is a pinned dry specimen with a label on the pin with “Portunus anceps (SAUSSURE) TYPUS! Türkay revid. VII.1970” typewritten on it. The specimen has lost three left legs, one right leg and parts of one left leg and three right legs. The identification label has “Cuba Mr H de Saussure” written on it. A second pinned dry specimen in the same box [MHNG-ARTO-16369] was designated as a paralectotype. Both specimens were illustrated in Türkay (1971: plate 3). Two other specimens placed under this name in the same box were identified by Türkay (1971: 125) as syntypes of *Lupea duchassagni* Desbonne in Desbonne & Schramm, 1867, a junior synonym of *L. anceps* Saussure, 1857. It is stated in Desbonne & Schramm (1867) that their specimens were compared with the types of Saussure and Stimpson, but it is not stated explicitly where their type specimens are deposited. It is possible, that if this is indeed a type specimen, that there are others present in the MHNG.

Portunus anceps (Saussure, 1857)

armatus Saussure, 1853: 355-357, pl. 13, fig. 1 [*Mithrax*].
Côte occidentale du Mexique; Mazatlan. Unspecified number of ♀.

No specimens found in the MHNG collection. According to Boyko (2000: 128) there is a ♀ type specimen from Mazatlan (referred to as the holotype) in the ANSP [ANSP CA3843].

Mithrax armatus Saussure, 1853

aztecus Saussure, 1857c: 503-504 [*Cambarus*].
Mexique. Unspecified series.

Saussure (1858: 461) gave the type locality as “Tomatlan, dans les Terres-Chaudes”. Hobbs (1987) stated that there was a syntype in the collections of the USNM (and 13 in MHNG). The MHNG collection contains eleven pinned dried specimens in Crustacea box 68. Four of these [MHNG-ARTO-14912 to MHNG-ARTO-14915]

have “Tomatlan (Mexique), M H d Saussure” written on the associated identification label and are syntypes. The specimens are in good condition apart from each having lost most of their antennae. The identification label associated with the other specimens [MHNG-ARTO-14916 to MHNG-ARTO-14922] have “Misantla, Mexique, Dr Vogt” written on it, and these specimens are not part of the type series.

A junior synonym of *Procambarus mexicanus* (Erichson, 1846)

aztecus Saussure, 1857c: 504 [*Palaemon*].

Vera-Cruz. Unspecified series.

Saussure (1858: 466) stated that he found the species in good quantities at Vera Cruz and at the mouth of the “Rio de Tampico”. The MHNG collection contains five pinned dry specimens [MHNG-ARTO-14671 to MHNG-ARTO-14675] in Crustacea box 52 and one pinned dry specimen [MHNG-ARTO-14686] in Crustacea box 52d. The species name labels pinned in both boxes have “Vera Cruz” written on them and the specimens are syntypes. The specimens in box 52 have lost the ends of many appendages; the specimen in box 52d has lost the appendages of the left side and the ends of most of the appendages of the right.

A junior synonym of *Macrobrachium carcinus* (Linnaeus, 1758)

bicornis Saussure, 1857c: 501 [*Pericera*].

Antilles. Unspecified series.

The MHNG collection includes four specimens under the name *Microphrys bicornutus* which are probably syntypes of this species. Two pinned dry specimens in Crustacea box 133 [MHNG-ARTO-15980 and MHNG-ARTO-15981] are placed with a label pinned in the box with “galibica Desbr., Pericera bicornis Sss., Milnia bicornuta Simps., Guadeloupe ♂♀ M H de S.” written on it. Both of these specimens are in excellent condition. Two pinned dry specimens in Crustacea box 135f [MHNG-ARTO-16114 and MHNG-ARTO-16115] have “bicornutus Latr., Guadeloupe, M He de Saussure” written on the species name label pinned in the box and are less certainly syntypes. Both of these specimens have lost some of their legs.

A junior synonym of *Omalacantha bicornuta* (Latreille, 1825)

consobrinus Saussure, 1857a: 101-102 [*Cambarus*].

Les mares de la partie centrale de l'île de Cuba. Unspecified number of ♂ and ♀.

The MHNG collection contains eight pinned dry specimens [MHNG-ARTO-14904 to MHNG-ARTO-14911] in Crustacea box 68, four pinned dry specimens in Crustacea box 69 [MHNG-ARTO-14947 to MHNG-ARTO-14950] and one pinned dry specimen in Crustacea box 60b [MHNG-ARTO-14796]. There is also a card mount with dissected appendages glued to it in

Crustacea box 68. All of the specimens in Crustacea box 68 are in fairly good condition apart from each having lost most of their antennae. The identification label in this box has “Cuba M H d Saussure” written on it and the specimens are syntypes. The specimens in Crustacea box 69 are rather shrivelled and have lost appendages; they are palced under the name *Procambarus cubensis* (Erichson), but each has a label on the pin with “Camb. consbrinus, Cuba, Sauss.” and these are probably also syntypes. The specimen in box 60b (a mixed box of “doubles”) is in good condition, lacking the ends of the antennae. It has only “Cuba” written on the identification label, but is probably also a syntype.

A junior synonym of *Procambarus cubensis* (Erichson, 1846)

consobrinus Saussure, 1857c: 504-505 [*Palaemon*].

Vera-Cruz. Unspecified series.

The MHNG collection contains three pinned dry specimens [MHNG-ARTO-14587, MHNG-ARTO14607 and MHNG-14608] and two vials, each containing four small dry specimens, secured by pins through the cork stoppers [MHNG-ARTO-14609 and MHNG-ARTO-14610] in Crustacea box 47. The species name label pinned in the box under the pinned specimens has “Vera Cruz, M H de Saussure” written on it, indicating that the specimens are syntypes. The label pinned in the box under the specimens in tubes has “Ventosa (Mexique)” written on it and the specimens are not part of the type series. The syntypes have insect feeding damage and the ends of most of the appendages are missing.

A junior synonym of *Macrobrachium olfersii* (Wiegmann, 1836)

convexa Saussure, 1853: 362-364, pl. 13, fig. 3 [*Calappa*].

Côte occidentale du Mexique; Mazatlan. Unspecified series.

No specimens found in the MHNG collection. According to Boyko (2000: 130) there are two ♂ syntypes from Mazatlan in the ANSP [ANSP CA3695].

Calappa convexa Saussure, 1853

cornutus Saussure, 1857c: 501 [*Mithrax*].

Antilles. Unspecified number of ♀.

The MHNG collection contains two pinned dry specimens [MHNG-ARTO-15960 and MHNG-ARTO-15961] in Crustacea box 129. The species name label in the box has “Antilles ♀ M H de Sauss.” written on it and the specimens are syntypes. The first has lost six legs, the second has lost two.

Nemausa cornuta (Saussure, 1857)

crenulatus Saussure, 1857c: 501-502 [*Lambrus*].

Antilles. Unspecified series.

Saussure (1858: 430) stated that he has several individuals. The MHNG collection contains five pinned dry spe-

cimens under the name *Platylambrus serratus*. Four specimens in Crustacea box 138 [MHNG-ARTO-16129 to MHNG-ARTO-16132] have “Antilles M de Sauss.” written on the species name label in the box. Each specimen is supported on a card mount added to the pin. Three have the front legs detached and glued to the card and have lost most of the smaller legs. The single specimen in Crustacea box 135f [MHNG-ARTO-16118] is also supported on a card mount and has lost most of the smaller legs. These specimens are syntypes.

A junior synonym of *Platylambrus serratus* (H. Milne Edwards, 1834)

cristata Saussure, 1857b: 306 [*Sicyona*].

Cuba. Unspecified series.

The MHNG collection contains one pinned dry specimen [MHNG-ARTO-13923] in Crustacea box 31. The species name label pinned in the box has “Cuba, M H de Saussure” written on it, indicating that the specimen is a syntype. The specimen, which has been repaired with glue, has insect feeding damage and lacks the ends on most of its appendages. A note in the box states that the name is a junior homonym [of *S. cristata* de Haan, 1844]. A replacement name was proposed by Stimpson (1871: 159).

Replaced by the name *Sicyona brevirostris* Stimpson, 1871

cubensis Saussure, 1858: 455-456 [*Pagurus*].

Les côtes de Cuba. Unspecified series.

The MHNG contains one pinned dried specimen [MHNG-ARTO-15332] and three specimens [MHNG-ARTO-15333 to MHNG-ARTO-15335] still in the host shells, which are glued to individual cork mounts on pins in Crustacea box 87. The pinned specimen has lost most of the appendages and the rear of the body is detached and secured on a separate pin. The other specimens, two of which are very small, are mostly hidden by the shells and have lost their antennae. The identification label has “Cuba, M H de Saussure” written on it and the specimens are probably all syntypes.

A junior synonym of *Clibanarius sclopetarius* (Herbst, 1796)

cubensis Saussure, 1857c: 503 [*Remipes*].

Cuba. Unspecified series.

Saussure (1858: 452) stated that he had many specimens of all ages. The MHNG collection contains twenty-four pinned dried specimens [MHNG-ARTO-15590 to MHNG-ARTO-15613] accompanied by a card mount with many appendages glued to it, in Crustacea box 99. The identification label in the box has “Cuba, M H de Saussure” written on it and these specimens are syntypes. There is insect feeding damage to some of the larger specimens, and many have lost appendages. There is also one pinned dry specimen in Crustacea box 100bis [MHNG-ARTO-15630]. The identification label in the

box only has “Cuba” written on it but the specimen, which has lost three legs, is probably a syntype.

A junior synonym of *Hippa testudinaria* (Herbst, 1791)

depressus Saussure, 1857b: 305 [*Gecarcinus*].

Haiti. Unspecified series.

The MHNG collection contains two specimens [MHNG-ARTO-16403 and MHNG-ARTO-16404] which have been transferred from the dry collection into alcohol, and are stored in separate tubes in the same jar. Both have the remaining appendages detached, the second has a damaged carapace and is accompanied by a small vial containing dissected parts. The jar contains two typewritten labels that indicate that Türkay revised the specimens in 1972 and identified them as *G. lateralis lateralis* (Fréminville, 1836) (this authority was used by Türkay, 1970: 337). The original identification label, which is still pinned in Crustacea box 199, has “Haiti M H de Saussure” written on it, indicating that the specimens are syntypes.

A junior synonym of *Gecarcinus lateralis* (Guérin-Méneville, 1832)

dubius Saussure, 1858: 445, fig. 16 [*Metopograpsus*].

Les Antilles; Saint-Thomas. Unspecified number of ♀.

The MHNG contains one pinned dry specimen [MHNG-ARTO-16423] in Crustacea Box 190 with a label on the pin on which “Etiqueté comme Goniograpsus dubius Sauss. Ile St. Thomas” is written, apparently by Zehntner. The right claw is detached and glued to the label on the pin. A typed label pinned in the box indicates that Türkay revised the specimen in 1971 and identified it as *Pachygrapsus transversus* (Gibbes), to which a printed “Typus” label has been glued. Türkay (1974: 142) referred to this specimen as the ♀ holotype, which represents an inadvertent lectotype designation.

A junior synonym of *Pachygrapsus transversus* (Gibbes, 1850)

edwardsii Saussure, 1853: 366-367, pl. 12, fig. 3 [*Porcellana*].

Côte occidentale du Mexique; Mazatlan. Unspecified series.

No specimens found in the MHNG collection. According to Boyko (2000: 130) there are three possible syntypes (one ♂ and two ♀) in the ANSP [ANSP CA4152], although unlike the other specimens he discussed those of *P. edwardsii* did not have the locality Mazatlan on the label. One of these specimens (the one lacking a supra-ocular spine) was designated as the lectotype by Hillier & Werding (2007: 191).

Petrolisthes edwardsii (Saussure, 1853)

faustinus Saussure, 1857c: 505 [*Palaemon*].

Haiti. Unspecified series.

The MHNG collection contains five pinned dry specimens [MHNG-ARTO-14661 to MHNG-ARTO-14665]

in Crustacea box 52 and three pinned dry specimens [MHNG-ARTO-14681 to MHNG-ARTO-14683] in Crustacea box 52d under this name. According to the data written on the species name labels pinned in the box, those in box 52 come from Cuba and Mexico and are not part of the type series. The species name label pinned in box 52d has “Haiti, M H de Saussure” written on it, indicating that these specimens are syntypes. One of these [MHNG-ARTO-14681] has lost the ends of most of the right appendages, while another [MHNG-ARTO-14683] has lost the ends of the rear left appendages.

Macrobrachium faustinum (Saussure, 1857)

gracilis Saussure, 1857c: 502-503 [*Metapograpsus*]. Saint-Thomas. Unspecified series.

The MHNG collection contains one pinned dry specimen [MHNG-ARTO-16424] under this name in Crustacea box 190. The identification label in the box has “Ile St Thomas, M H de Saussure” written on it and there is a label pinned in the box indicating that Türkay revised the specimen in 1971 to which a printed “Typus” label has been glued. The carapace is cracked and two legs are missing. Türkay (1974: 144) referred to this specimen as the ♀ holotype which represents an inadvertent lectotype designation.

Pachygrapsus gracilis (Saussure, 1857)

gracilis Saussure, 1858: 449-450 [*Plagusia*].

Les Antilles, Cuba. Unspecified series (many individuals).

The MHNG contains two pinned dry specimens placed under the name *P. depressa*; the first [MHNG-ARTO-16426] is in Crustacea box 197, the second [MHNG-ARTO-16437] in Crustacea box 197a. The first specimen is in excellent condition. The identification label pinned in the box has “Guadeloupe M. de Sauss.” written on it. There is a typed label pinned in the box indicating that Türkay revised the specimen in 1971, that he identified it as *Plagusia depressa* (Fabricius), and which has a printed “Typus” label glued to it. The second specimen is supported on a card mount and the carapace is broken. One left leg and two right legs are missing and the others are held in place with glue. The identification label pinned in the box has “Cuba, M H de Saussure” written on it. There is a typewritten label pinned in the box indicating that Türkay revised the specimen in 1971 and that he identified it as *Plagusia depressa* (Fabricius), and which has a printed “Typus” label glued to it. It is not clear whether the locality of the first specimen is given incorrectly on the label or if Türkay was mistaken in identifying it as a syntype, but the label is not original (Saussure is spelled in full on the older labels) and it is probable that Türkay was correct.

A junior synonym of *Plagusia depressa* (Fabricius, 1775)

guadalupe Saussure, 1857c: 502 [*Portunus*].

Guadeloupe. Unspecified series.

The MHNG collection contains one pinned dry specimen [MHNG-ARTO-16318] in Crustacea box 146. The identification label in the box gives the name as “guadeloupensis” and has “Guadeloupe, ♂, M H de Saussure” written on it. The specimen, which has lost the ends of two legs, is accompanied by a label pinned in the box on which “Macropipus guadulpensis (SAUSSURE) Holotypus, M. Türkay revid. VIII.1970” is written and to which a printed label on red card with “TYPUS” written on it has been glued. It is not clear why Türkay followed the orthography of the specific epithet used by Saussure (1858: 433) rather than that in the original description. Türkay (1971: 118) referred to this specimen as the holotype, which represents an inadvertent lectotype designation.

Macropipus guadalupe (Saussure, 1857)

insignis Saussure, 1857c: 503 [*Pagurus*].

Guadeloupe. Unspecified series.

The MHNG collection contains one dried specimen [MHNG-ARTO-15275] pinned into position in Crustacea box 84. The identification label has “insignis? Sauss., Cuba, M H de Saussure” written on it, indicating that it is not part of the type series. The whereabouts of the type(s) is unknown.

Dardanus insignis (Saussure, 1857)

jurinei Saussure, 1853: 365-366, pl. 13, fig. 4 [*Guaia*].

Côte occidentale du Mexique; Mazatlan. Unspecified series.

No specimens found in the MHNG collection. According to Boyko (2000: 130) there are five ♂ and three ♀ syntypes from Mazatlan in the ANSP [ANSP CA3695].

Leucosilia jurinei (Saussure, 1853)

lucasia Saussure, 1853: 367, pl. 12, fig. 4 [*Albuminea*].

Côte occidentale du Mexique; Mazatlan. Unspecified series.

No specimens found in the MHNG collection. According to Boyko (2000: 130) there is one ♀ type specimen from Mazatlan (referred to as the holotype) in the ANSP [ANSP CA41021].

Albunea lucasia Saussure, 1853

lutaria Saussure, 1857a: 100-101 [*Halopsyche*].

Côtes de Cuba. Unspecified series.

The MHNG collection contains one pinned dry specimen [MHNG-ARTO-14113] under the name *Alpheus lutarius* in Crustacea box 33. The body of the specimen is pinned, and has a label with “Cuba” and a label with “Selon T. E. Yves Proceed. Ac. Nat Sci Philad. 31 March 1891 pag. 183 l'Alpheus luctarius Sss. est synonym. avec A. heterochaelis Say” written on it on the pin. The species name label pinned in the box has “Cuba, M H de Saussure” written on it, indicating that the specimen is a syntype.

Most of the anterior appendages have been removed, glued to a piece of card and annotated in ink.

A junior synonym of *Alpheus heterochaelis* Say, 1818

mexicana Saussure, 1857c: 505 [*Caridina*].

Vera-Cruz. Unspecified series.

Saussure (1858: 463) gave a size range, indicating that he had more than one specimen. The MHNG collection contains one pinned dry specimen [MHNG-ARTO-13987] under this name in Crustacea box 32. The pin has a label with “Vera Cruz” written on it and the species name label pinned in the box has “Vera Cruz, M H de Saussure” written on it, indicating that it is a syntype. The specimen is in fairly good condition with most appendages intact.

Potimirim mexicana (Saussure, 1857)

mexicanus Saussure, 1857c: 504 [*Palaemon*].

Cuba et Mexique. Unspecified series.

Saussure (1858: 468) noted that this species was valued as a food resource. The MHNG collection contains six pinned dry specimens [MHNG-ARTO-14590 and MHNG-ARTO-14601 to MHNG-ARTO-14605] in Crustacea box 48. The species name label pinned in the box has “Mexique, M H de Saussure” written on it and these specimens are syntypes. Although all the specimens have most appendages intact, specimen MHNG-ARTO-14602 has the pleon detached and in two pieces, held in place by other pins, MHNG-ARTO-14603 has the end of the pleon detached and held in place by other pins, and the abdomen of MHNG-ARTO-14605 has been reattached with glue. There are two small pinned dry specimens [MHNG-ARTO-14596 and MHNG-ARTO-14597] in Crustacea box 49. Both have a label on the pin with “Vera Cruz” written on it, and the species name label pinned in the box has “Vera Cruz, M^r H de Sauss.” written on it, indicating that these specimens are syntypes. Both have lost some appendages. There are eleven pinned dry specimens [MHNG-ARTO-14691 to MHNG-ARTO-14701] in Crustacea box 52e. A label in the box states that these specimens are “doubles”. The species name label pinned in the box under these specimens has “Mexique” written on it and these specimens are probably also syntypes. They all have some insect feeding damage and many of the appendages lack the ends. There are two further specimens [MHNG-ARTO-14593 and MHNG-ARTO-14594] in Crustacea box 49, but the species name label pinned in the box under these specimens gives the identification as “mexicanus?” and therefore these specimens cannot be considered syntypes.

A junior synonym of *Macrobrachium acanthurus* (Wiegmann, 1836)

miniata Saussure, 1857b: 306 [*Sesarma*].

Ile de Saint-Thomas. Unspecified series.

The MHNG collection has six pinned dry specimens [MHNG-ARTO-16410 to MHNG-ARTO-16415] in Crustacea box 194. The last has a label on the pin with “Ile St Thomas” written on it and the identification label

pinned in the box has “St Thomas, M H de Saussure” written on it, indicating that the specimens are syntypes. All of the specimens have lost legs, and the third lacks the left eye.

A junior synonym of *Armases ricordi* (H. Milne Edwards, 1853)

miniatus Saussure, 1857c: 503 [*Metapograpus*].

Saint-Thomas. Unspecified series.

The MHNG collection contains one pinned dry specimen [MHNG-ARTO-16425] with a label on the pin on which “Etiqueté comme Goniograpsus miniatus Sauss. Ile St Thomas” is written. A typed label pinned in the box indicates that Türkay revised the specimen in 1971 and identified it as *Pachygrapsus transversus* (Gibbes), and which has a printed “Typus” label attached to it. The specimen has a card support to which two detached legs have been glued. Four legs are missing. Türkay (1974: 142) referred to this specimen as the ♂ holotype, which represents an inadvertent lectotype designation.

A junior synonym of *Pachygrapsus transversus* (Gibbes, 1850)

minutus Saussure, 1858: 425-426, fig. 1 [*Mithrax*].

Mers des Antilles. More than one ♂ and ♀.

The MHNG collection contains three specimens are labelled as having been identified as *M. minutus* and are almost certainly syntypes in Crustacea box 127. Two pinned dry specimens [MHNG-ARTO-15921 and MHNG-ARTO-15922] have an identification label pinned in the box with “Etiquetés comme Mithrax minutus de Sauss, cependant c’est Mithraculus sculptus Edw.” written on it, apparently by Zehntner. The second has lost the hindmost three left legs and the last right leg. Another pinned dry specimen [MHNG-ARTO-15940] has an identification label pinned in the box with “Etiqueté comme Mithrax minutus de Sauss.” and “Mithraculus coronatus Herbst, Guadeloupe” written on it, apparently by Zehntner. It is possible that some of the other specimens in this box were also part of the type series, but they cannot be positively identified.

A junior synonym of *Mithraculus sculptus* (Lamarck, 1818)

montezumae Saussure, 1857a: 102 [*Cambarus*].

Marais de la vallée de Mexico. Unspecified number of ♂ and ♀.

Saussure (1858: 460) stated that he had found this species in great abundance at Chapultepec, a league from Mexico City. The MHNG collection contains 13 pinned dry specimens [MHNG-ARTO-14933 to MHNG-ARTO-14945] and a card mount with detached appendages glued to it. The larger specimens are in fairly good condition although most have lost some appendages; the smaller specimens are shrivelled. The identification label in the box has “Chapultepec (Mexique) M H de Saussure” and the specimens are all syntypes. Crustacea box 69.

Cambarellus montezumae (Saussure, 1857)

montezumae Saussure, 1857c: 504 [*Palaemon*].

Vera-Cruz. Unspecified series.

The MHNG collection contains three pinned dry specimens [MHNG-ARTO-14668 to MHNG-ARTO-14670] in Crustacea box 52. One of the specimens has a label "Vera Cruz" on the pin and the species name label pinned in the box has "Vera Cruz, M H de Saussure" written on it, indicating that the specimens are syntypes. All of the specimens have lost most of their appendages and MHNG-ARTO-14668 has lost the entire pleon.

A junior synonym of *Macrobrachium carcinus* (Linnaeus, 1758)

occidentalis Saussure, 1857c: 502 [*Panopeus*].

Guadeloupe. Unspecified series.

The MHNG collection contains three pinned dry specimens [MHNG-ARTO-16427 to MHNG-ARTO-16429] in Crustacea box 181. The identification label pinned in the box has "Guadeloupe M H de Saussure" written on it, indicating that the specimens are syntypes. The first specimen has been repaired with glue and all have lost at least one leg.

Panopeus occidentalis Saussure, 1857

picteti Saussure, 1853: 357-359, pl. 13, fig. 2 [*Othonia*].

Côte occidentale du Mexique; Mazatlan. Unspecified number of ♂.

No specimens found in the MHNG collection. According to Boyko (2000: 128) there is a ♂ type specimen from Mazatlan (referred to as the holotype) in the ANSP [ANSP CA3989].

Pitho picteti (Saussure, 1853)

quadrata Saussure, 1857b: 305 [*Cardisoma*].

Haiti. Unspecified series.

Saussure (1858: 438) stated that he had found this species to be fairly abundant in brackish marshes near the shore. The MHNG collection contains three specimens [MHNG-ARTO-16405 to MHNG-ARTO-16407] that have been transferred from the dry collection into alcohol, each in a separate jar. Most of the appendages of all three specimens are detached. Each jar contains a typewritten label that indicates that Türkay revised the specimens in 1970 and identified them as *C. guanhumi* Latreille. The original identification label, which is still pinned in Crustacea box 199, has "Haiti M H de Saussure" written on it, indicating that the specimens are syntypes.

A junior synonym of *Cardisoma guanhumi* Latreille, 1828

quadratus Saussure, 1853: 360-362, pl. 12, fig. 2 [*Gecarcinus*].

Côte occidentale du Mexique; Mazatlan. Unspecified number of ♂.

No specimens found in the MHNG collection. According to Boyko (2000: 128) there are parts of two syntypes from Mazatlan in the ANSP [ANSP CA3741].

Gecarcinus quadratus Saussure, 1853

serratus Saussure, 1857c: 502 [*Panopeus*].

Guadeloupe. Unspecified series.

Saussure (1858: 432) indicated that he had several specimens including juveniles and both sexes. The MHNG collection contains six pinned dry specimens [MHNG-ARTO-16430 to MHNG-ARTO-16435] in Crustacea box 180. The second specimen has a broken carapace, and all but the fourth have lost at least one leg. The identification label pinned in the box has "Guadeloupe M H de Saussure" written on it indicating that the specimens are syntypes.

A junior synonym of *Panopeus occidentalis* Saussure, 1857

spinosissima Saussure, 1857c: 501 [*Pericera*].

Antilles. Unspecified series.

Saussure (1858: 427) gave a more precise type locality, specifying Guadeloupe. The MHNG collection contains one pinned dry specimen [MHNG-ARTO-16013] in Crustacea box 134. The identification label in the box has "Guadeloupe, M H de Saussure" written on it and the specimen is part of the type series. The specimen has lost a leg from each side, and two of the right legs have been reattached with glue. Since the type series was unspecified, this specimen should be regarded as a syntype.

Stenocionops spinosissimus (Saussure, 1857)

tuberculatus Saussure, 1858: 450-451, fig. 9 [*Hepatus*].

Guadeloupe. Unspecified series.

The MHNG collection contains one pinned dry specimen [MHNG-ARTO-15726] in Crustacea box 112. The specimen has lost two legs and the pin is corroded where it enters the carapace. The species name label in the box has "Guadeloupe, M H de Saussure" written on it and the dimensions of the specimen match those given in the original description, indicating that the specimen is part of the type series. Since the series is unspecified, the specimen should be regarded as a syntype.

A junior synonym of *Hepatus pudibundus* (Herbst, 1785)

verreauxii Saussure, 1853: 359-360, pl. 12, fig. 1 [*Ozius*].

Côte occidentale du Mexique; Mazatlan. Unspecified series.

No specimens found in the MHNG. According to Boyko (2000: 128) there is a ♀ type specimen from Mazatlan (referred to as the holotype) in the ANSP [ANSP CA3483].

Ozius verreauxii Saussure, 1853

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